INSTALLATION MANUAL

SERIES 40 ROOFTOP

25, 30 & 40 TON

MODELS: V42
V33
V34

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NOTES, CAUTIONS AND WARNINGS

Installer should pay particular attention to the words: *NOTE*, *CAUTION*, and *WARNING*. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

CAUTION: READ ALL SAFETY GUIDES BEFORE YOU BEGIN TO INSTALL YOUR UNIT.

SAVE THIS MANUAL

ISO 9001
Certified Quality
Management System

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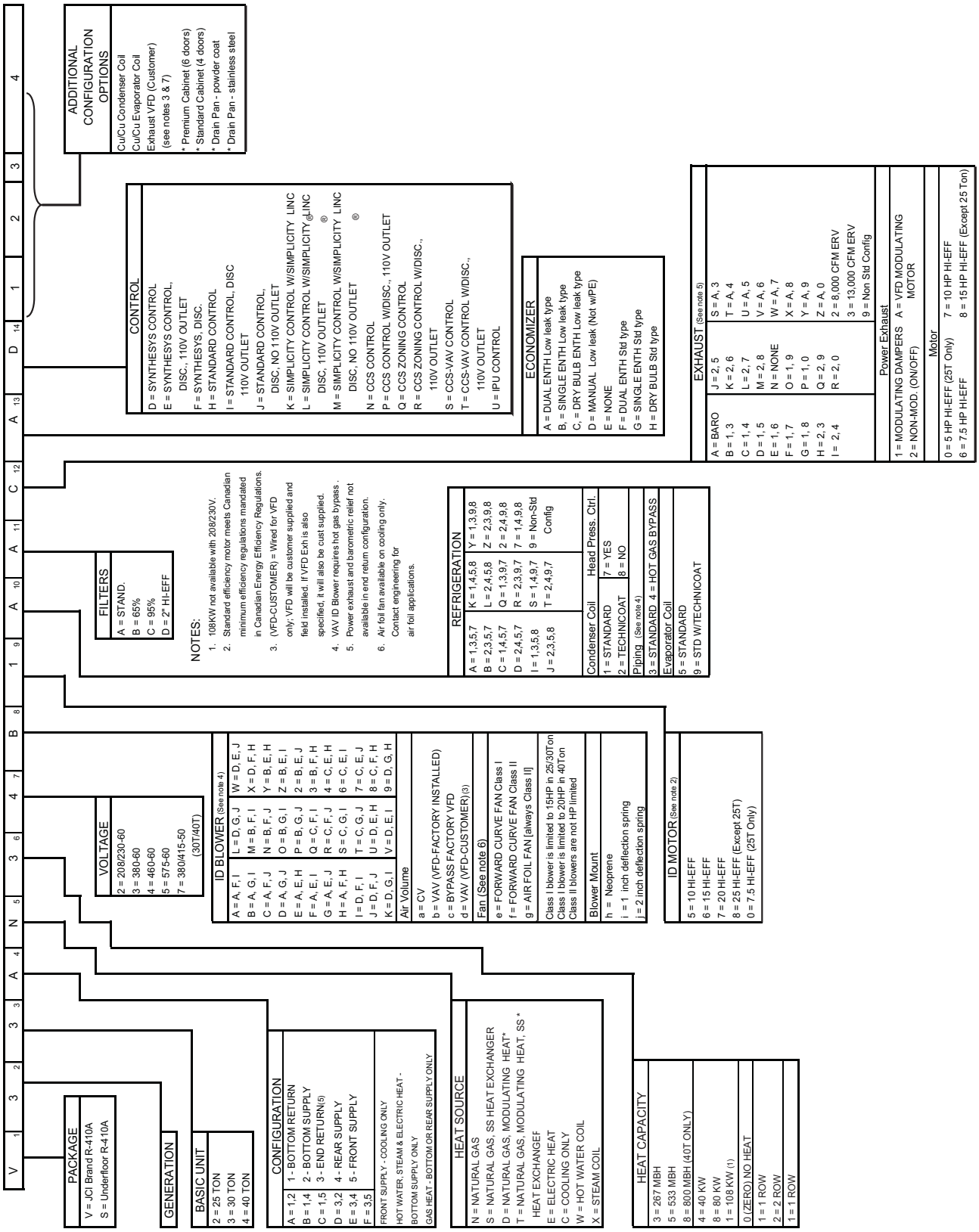

V
1
3
2
3
A
4
N
5
B
8
4
7
3
6
1
9
A
10
A
11
C
12
A
13
D
14
1
2
3
4
PACKAGE
V = JCI Brand R-410A
S = Underfloor R-410A
GENERATION
BASIC UNIT
2 = 25 TON
3 = 30 TON
4 = 40 TON
CONFIGURATION
A = 1,2 1 - BOTTOM RETURN
B = 1,4 2 - BOTTOM SUPPLY
C = 1,5 3 - END RETURN(5)
D = 3,2 4 - REAR SUPPLY
E = 3,4 5 - FRONT SUPPLY
F = 3,5
FRONT SUPPLY - COOLING ONLY
HOT WATER, STEAM & ELECTRIC HEAT - BOTTOM SUPPLY ONLY
GAS HEAT - BOTTOM OR REAR SUPPLY ONLY
HEAT SOURCE
N = NATURAL GAS
S = NATURAL GAS, SS HEAT EXCHANGER
D = NATURAL GAS, MODULATING HEAT*
T = NATURAL GAS, MODULATING HEAT, SS * HEAT EXCHANGEF
E = ELECTRIC HEAT
C = COOLING ONLY
W = HOT WATER COIL
X = STEAM COIL
HEAT CAPACITY
3 = 267 MBH
5 = 533 MBH
8 = 800 MBH (40T ONLY)
4 = 40 KW
8 = 80 KW
1 = 108 KW (1)
0 (ZERO) NO HEAT
1 = 1 ROW
2 = 2 ROW
1 = 1 ROW
VOLTAGE
2 = 208/230-60
3 = 380-60
4 = 460-60
5 = 575-60
7 = 380/415-50 (30T/40T)
ID BLOWER (See note 4)
A = A, F, I L = D, G, J W = D, E, J
B = A, G, I M = B, F, I X = D, F, H
C = A, F, J N = B, F, J Y = B, E, H
D = A, G, J O = B, G, I Z = B, E, I
E = A, E, H P = B, G, J 2 = B, E, J
F = A, E, I Q = C, F, I 3 = B, F, H
G = A, E, J R = C, F, J 4 = C, E, H
H = A, F, H S = C, G, I 6 = C, E, I
I = D, F, I T = C, G, J 7 = C, E, J
J = D, F, J U = D, E, H 8 = C, F, H
K = D, G, I V = D, E, I 9 = D, G, H
Air Volume
a = CV
b = VAV (VFD-FACTORY INSTALLED)
c = BYPASS FACTORY VFD
d = VAV (VFD-CUSTOMER) (3)
Fan (See note 6)
e = FORWARD CURVE FAN Class I
f = FORWARD CURVE FAN Class II
g = AIR FOIL FAN [always Class II]
Class I blower is limited to 15HP in 25/30Ton
Class I blower is limited to 20HP in 40Ton
Class II blowers are not HP limited
Blower Mount
h = Neoprene
i = 1 inch deflection spring
j = 2 inch deflection spring
ID MOTOR (See note 2)
5 = 10 HI-EFF
6 = 15 HI-EFF
7 = 20 HI-EFF
8 = 25 HI-EFF (Except 25T)
0 = 7.5 HI-EFF (25T Only)
FILTERS
A = STAND.
B = 65%
C = 95%
D = 2" HI-EFF
NOTES:
1. 108KW not available with 208/230V.
2. Standard efficiency motor meets Canadian minimum efficiency regulations mandated in Canadian Energy Efficiency Regulations.
3. (VFD-CUSTOMER) = Wired for VFD only; VFD will be customer supplied and field installed. If VFD Exh is also specified, it will also be cust supplied.
4. VAV ID Blower requires hot gas bypass.
5. Power exhaust and barometric relief not available in end return configuration.
6. Air foil fan available on cooling only. Contact engineering for air foil applications.
REFRIGERATION
A = 1,3,5,7 K = 1,4,5,8 Y = 1,3,9,8
B = 2,3,5,7 L = 2,4,5,8 Z = 2,3,9,8
C = 1,4,5,7 Q = 1,3,9,7 2 = 2,4,9,8
D = 2,4,5,7 R = 2,3,9,7 7 = 1,4,9,8
I = 1,3,5,8 S = 1,4,9,7 9 = Non-Std Config
J = 2,3,5,8 T = 2,4,9,7
Condenser Coil
1 = STANDARD
2 = TECHNICOAT
Head Press. Ctrl.
7 = YES
8 = NO
Piping (See note 4)
3 = STANDARD 4 = HOT GAS BYPASS
Evaporator Coil
5 = STANDARD
9 = STD W/TECHNICOAT
CONTROL
D = SYNTHESYS CONTROL
E = SYNTHESYS CONTROL, DISC., 110V OUTLET
F = SYNTHESYS, DISC.
H = STANDARD CONTROL
I = STANDARD CONTROL, DISC 110V OUTLET
J = STANDARD CONTROL, DISC, NO 110V OUTLET
K = SIMPLICITY CONTROL W/SIMPLICITY LINC
L = SIMPLICITY CONTROL W/SIMPLICITY® LINC DISC, 110V OUTLET
M = SIMPLICITY CONTROL W/SIMPLICITY® LINC DISC, NO 110V OUTLET
N = CCS CONTROL
P = CCS CONTROL W/DISC., 110V OUTLET
Q = CCS ZONING CONTROL
R = CCS ZONING CONTROL W/DISC., 110V OUTLET
S = CCS-VAV CONTROL
T = CCS-VAV CONTROL W/DISC., 110V OUTLET
U = IPU CONTROL
ECONOMIZER
A = DUAL ENTH Low leak type
B, = SINGLE ENTH Low leak type
C, = DRY BULB ENTH Low leak type
D = MANUAL Low leak (Not w/PE)
E = NONE
F = DUAL ENTH Std type
G = SINGLE ENTH Std type
H = DRY BULB Std type
EXHAUST (See note 5)
A = BARO J = 2, 5 S = A, 3
B = 1, 3 K = 2, 6 T = A, 4
C = 1, 4 L = 2, 7 U = A, 5
D = 1, 5 M = 2, 8 V = A, 6
E = 1, 6 N = NONE W = A, 7
F = 1, 7 O = 1, 9 X = A, 8
G = 1, 8 P = 1, 0 Y = A, 9
H = 2, 3 Q = 2, 9 Z = A, 0
I = 2, 4 R = 2, 0 2 = 8,000 CFM ERV
3 = 13,000 CFM ERV
9 = Non Std Config
Power Exhaust
1 = MODULATING DAMPERS A = VFD MODULATING MOTOR
2 = NON-MOD. (ON/OFF)
Motor
0 = 5 HP HI-EFF (25T Only) 7 = 10 HP HI-EFF
6 = 7.5 HP HI-EFF 8 = 15 HP HI-EFF (Except 25 Ton)
ADDITIONAL CONFIGURATION OPTIONS
Cu/Cu Condenser Coil
Cu/Cu Evaporator Coil
Exhaust VFD (Customer) (see notes 3 & 7)
* Premium Cabinet (6 doors)
* Standard Cabinet (4 doors)
* Drain Pan - powder coat
* Drain Pan - stainless steel

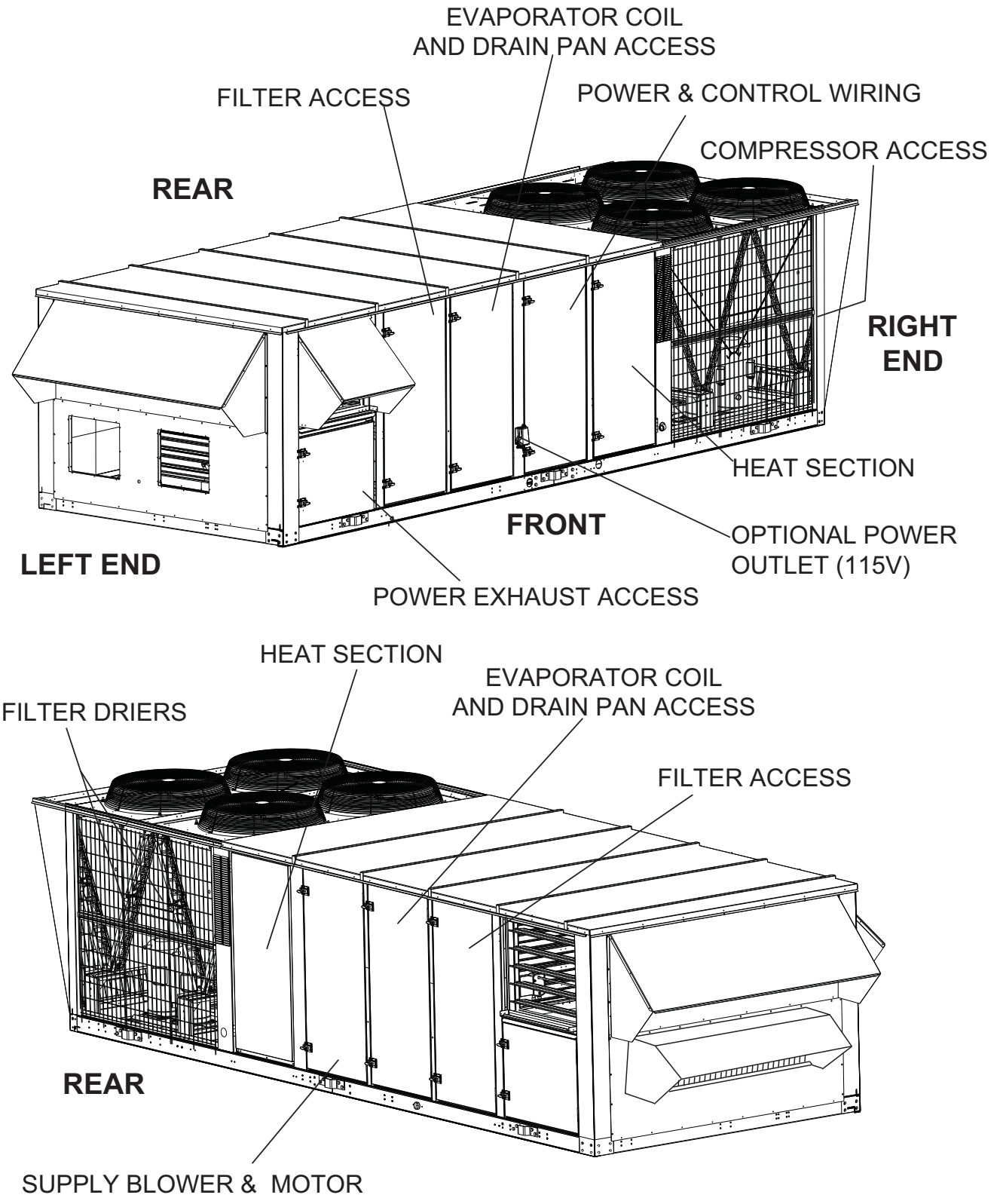


FIGURE 1 - COMPONENT LOCATION

GENERAL

Johnson Controls Series 40 V42/V33/V34 units are single package cooling only or cooling with gas, electric, hot water or steam heating designed for outdoor installation on a rooftop and for non-residential use.

The units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power, gas, steam, or hot water connections and duct connections. Gas fired units also require installation of a flue gas outlet hood.

Reference R-410A Quick Reference Guide, Figure 55 for R-410A Refrigerant information.

SAFETY CONSIDERATIONS

NOTES, CAUTIONS AND WARNINGS

Installer should pay particular attention to the words: *NOTE*, *CAUTION*, and *WARNING*. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

GAS FIRED MODELS

DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

Do not try to light any appliance. Do not touch any electrical switch. Do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

⚠ CAUTION

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 0.5 psig. Pressures greater than 0.5 will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to a pressure greater than 0.5 psig, it must be replaced. The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of that system at test pressures equal to or less than 0.5 psig.

⚠WARNING

This Furnace is not to be used for temporary heating of buildings or structures under construction.

ALL MODELS

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system. Gage sets, hoses, refrigerant containers and recovery systems must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer. Failure to use R-410A compatible servicing equipment may result in property damage or injury.

Installation and servicing of air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service air conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply.

Follow all safety codes, including ANSI Z223.1-Latest Edition: wear safety glasses and work gloves; use quenching cloth for unbrazing operations; have fire extinguisher available for all brazing operations.

⚠WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

REFERENCE

Additional information is available in the following reference form:

- 355278 - Technical Guide

APPROVALS

Designed certified by CSA, ETL, CETL as follows:

1. For use as a forced air furnace with cooling unit (gas heat models).
2. For outdoor installation only.
3. For installation on combustible material and may be installed directly on combustible flooring or Class A, Class B or Class C roof covering materials.
4. For use with natural gas (convertible to LP with kit).

Not suitable for use with conventional venting systems.

INSTALLATION

PRECEDING INSTALLATION

If a factory option convenience outlet is installed, the weatherproof outlet cover must be field installed. The cover shall be located in the unit control box. To install the cover, remove the shipping label covering the convenience outlet, follow the instructions on the back of the weatherproof cover box, and attach the cover to the unit using the (4) screws provided..

⚠ CAUTION

208/230-3-60 and 380/415-3-50 units with factory installed Powered Convenience Outlet Option are wired for 230v and 415v power supply respectively. Change tap on transformer for 208-3-60 or 380-3-50 operation. See unit wiring diagram.

LIMITATIONS

The installation of this unit must conform to local building codes, or in the absence of local codes, with ANSI Z223.1 Natural Fuel Gas Code and /or CAN/CGA B149 installation codes.

In U.S.A.:

1. National Electrical Code ANSI/NFPA No. 70-Latest Edition.
2. National Fuel Gas Code Z223.1-Latest Edition.
3. Gas-Fired Central Furnace Standard ANSI Z21.47-Latest Edition.
4. Local gas utility requirements.

Refer to Table 1 for Cooling and Electrical Application Data and to Table 2 for Gas Heat Application Data.

After installation, gas fired units must be adjusted to obtain a temperature rise within the range specified on the unit rating plate.

If components are to be added to a unit to meet local codes, they are to be installed at the contractor's and/or the customer's expense.

Size of unit for proposed installation should be based on heat loss / heat gain calculation made according to the methods of the Air Conditioning Contractors of America (ACCA).

LOCATION

Use the following guidelines to select a suitable location for these units:

TABLE 1: COOLING & ELECTRICAL APPLICATION

UNIT POWER SUPPLY	VOLTAGE VARIATIONS	
	MIN. VOLTS	MAX VOLTS
575-3-60	540	630
208/230-3-60	187	252
460-3-60	432	504

TABLE 2: COOLING & ELEC. APP. LIMITATIONS

LIMITATIONS	MODEL		
	V42	V33	V34
Supply Air CFM (min./max)	6,000-12,500	6,000-15,000	8,000-20,000
Entering Wet Bulb Temp (F°) (min./max)	57/75	57/75	57/75
Ambient Temp	40/125	40/125	40/125
Min. Air Temperature on Gas Fired Heat Exchangers (°F)			
Aluminized	25	25	25
Stainless	0	0	0

1. Unit is designed for outdoor installation only.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for roof mount on curb.
4. Roof structures must be able to support the weight of the unit and its accessories. Unit must be installed on a solid level roof curb or appropriate angle iron frame.
5. Maintain level tolerance to 3/4 inches across width and 2 inches along length.

TABLE 3: STANDARD GAS HEATING CAPACITIES

Gas Heat Option	Available on Models	Input Capacity (MBH)[1]		Output Capacity (MBH)[2]	Gas Rate, Cu. Ft./Hr.[3]	
		1st Stage	Total		1st Stage	Total
N3	V42/V33/V34	267	267	213	247	247
N5	V42/V33/V34	267	533	426	247	495
N8	V34 ONLY	267[4]	800	638	247	742

1. Heating capacity is only staged on CV models. VAV models use only one stage at full capacity.
2. Blower motor heat not included.
3. Based on a heat content of 1075 Btu/Ft.[3]

$$\text{GAS RATE} = \frac{\text{Input MBH}}{(1.075 MBH)/Ft^3}$$

4. Unit Control Board with 3 heating outputs only. For all other Unit Control Boards the 1st Stage is 533 MBH.

TABLE 4: TEMPERATURE RISE

Ton	Modules		
	1	2	3
25	5-35	25-55	-
30	5-35	20-50	-
40	5-30	10-45	25-55

TABLE 5: MINIMUM HEATING CFM

Ton	Modules		
	1[1]	2	3
25	6,000	7,183	-
30	6,000	7,901	-
40	8,000	8,779	13,169

1. Calculated minimum CFM for maximum heat rise is 5,644 for 25/30T and 6,584 for 40T, 1 module.

TABLE 6: MODULATING GAS HEATING CAPACITIES

Gas Heat Option	Available on Models	Input Capacity (MBH)		Steps	Output Capacity (MBH)[1]	Gas Rate, Cu. Ft./Hr.	
		Minimum	Maximum			Minimum	Maximum
D3[2]	V42/V33/V34	69	267	6	213	64	247
D5[2]	V42/V33/V34	69	533	12	426	64	495
D8[2]	V34 ONLY	69	800	17	638	64	744

1. Output Capacity at Full Fire.
2. Modulating Gas Heat available on CV models only.

TABLE 7: MODULATING HEAT

Stages of Gas Control (% of Full Heat Output)					
Gas Heat Option	**Available on Models**	**Step**	**Input**	**Output**	**% of total output**
D3 (Turn down ratio 3.8 to 1)	V42, V33, V34	1	69,333	55,466	26%
		2	106,666	85,333	40%
		3	165,332	132,266	62%
		4	202,665	162,132	76%
		5	229,332	183,466	86%
		6	266,666	213,333	100%
D5 (Turn down ratio 7.7 to 1)	V42, V33, V34	1	69,333	55,466	13%
		2	106,666	85,333	20%
		3	165,332	132,266	31%
		4	202,665	162,132	38%
		5	229,332	183,466	43%
		6	266,666	213,333	50%
		7	325,331	260,265	61%
		8	362,664	290,132	68%
		9	389,331	311,465	73%
		10	426,664	341,331	80%
		11	495,997	396,798	93%
		12	533,330	426,664	100%
D8 (Turn down ratio 11.5 to 1)	V34 Only	1	69,333	55,466	9%
		2	106,666	85,333	13%
		3	165,332	132,266	21%
		4	202,665	162,132	25%
		5	229,332	183,466	29%
		6	266,666	213,333	33%
		7	325,331	260,265	41%
		8	362,664	290,132	45%
		9	389,331	311,465	49%
		10	426,664	341,331	53%
		11	495,997	396,798	62%
		12	533,330	426,664	67%
		13	586,663	469,330	73%
		14	655,996	524,797	82%
		15	693,329	554,663	87%
		16	762,662	610,130	95%
		17	799,995	639,996	100%

⚠ CAUTION

If a unit is to be installed on a roof curb other than a UP roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

If a unit is to be installed on an angle iron frame it is recommended that it be sized to allow the bottom rail to overhang to facilitate installation of condensate drains (see Fig. 4).

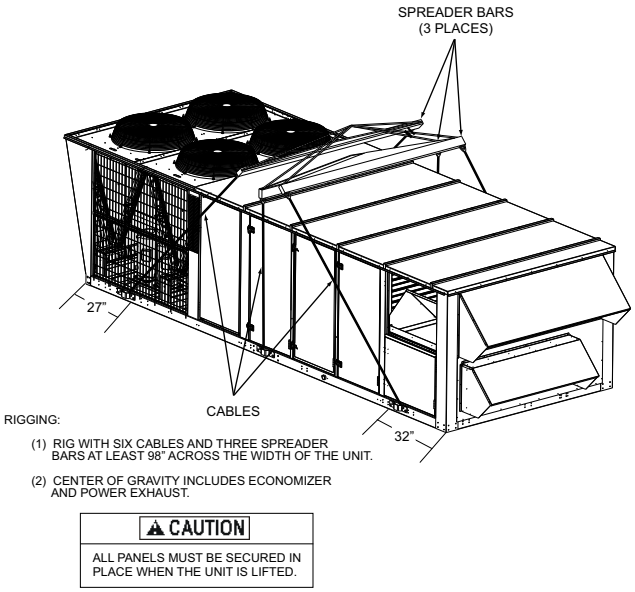

SPREADER BARS
(3 PLACES)
27"
CABLES
32"
RIGGING:
(1) RIG WITH SIX CABLES AND THREE SPREADER BARS AT LEAST 98" ACROSS THE WIDTH OF THE UNIT.
(2) CENTER OF GRAVITY INCLUDES ECONOMIZER AND POWER EXHAUST.
⚠ CAUTION
ALL PANELS MUST BE SECURED IN PLACE WHEN THE UNIT IS LIFTED.

FIGURE 2 - TYPICAL RIGGING

TABLE 8: UNIT WEIGHTS

COMPONENT	25 TON	30 TON	40 TON
Basic Unit	4410	4565	4845
Gas Heat			
267 MBH	180	180	180
533 MBH	320	320	320
800 MBH	-	-	450
Electric Heat			
40KW	40	40	40
80KW	105	105	105
108KW	110	110	110
Hot Water Heat			
1 Row Coil	70	70	70
2 Row Coil	85	85	85
Steam Heat			
1 Row Coil	85	85	85
Blower			
Forward Curve Fan (Std Fan)	0	0	0
FC IGV	155	155	175
Air Foil Fan	135	135	155
AF IGV	155	155	180
Motor - Supply Fan			
7.5hp	110	-	-
10hp	145	145	145
15hp	200	200	200
20hp	240	240	240
25hp	-	300	300
Supply Fan Motor VFD	See Table 9		
Refrigeration			
T-Coat Evap.	32	30	40
T-Coat cond.	32	30	40
Hot Gas Bypass	10	10	10
Low Ambient Head Pressure Control			
208-230/380/460	5	5	5
575	25	25	25
Filters			
6" Rigid	70	70	70
Exhaust[1]			
Exhaust Type			
Barometric	45	65	65
Modulated	140	275	275
Exhaust Motor			
5hp	80	80	80
7.5hp	110	110	110
10hp	145	145	145
15hp	200	200	200
Exhaust Motor VFD	See Table 10		
Economizer			
Std. Econ.	235	235	235
Econ. w/ERV	50	50	50
Control			
Disconnect	15	15	15
110V outlet	55	55	55
IPU	20	20	20
Roof Curb			
Partial Curb	415	415	415

1. If ERV and Supply Fan VAV are selected, add the weight of an Exhaust VFD, Table 9.

TABLE 9: SUPPLY FAN MOTOR VFD WEIGHTS

Supply Fan Motor VFD	230V	460V	575V
W/O Bypass			
7.5hp	60	25	30
10hp	60	25	30
15hp	75	50	60
20hp	75	50	60
25hp	115	50	60
W/Bypass			
7.5hp	155	90	120
10hp	155	90	120
15hp	185	140	155
20hp	185	140	155
25hp	255	140	155

TABLE 10: EXHAUST FAN MOTOR VFD WEIGHTS

Exhaust Fan Motor	230V	460V	575V
W/O Bypass			
5hp	15	10	20
7.5hp	50	15	20
10hp	50	15	20
15hp	65	40	50

NOTE: If the unit is VAV with ERV, add the weight of an exhaust VFD - it will be in the unit.

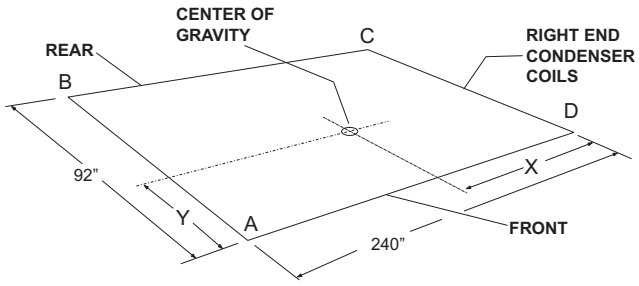


FIGURE 3 - CENTER OF GRAVITY[1]

1. Refer to Tables 11 and 12 for A, B, C, D and X and Y data respectively.

⚠ CAUTION

All panels must be secured in place when the unit is lifted.

The condenser coils should be protected from damage by the rigging cables with plywood or other suitable material.

An adhesive backed cover is provided over the outside of the combustion air inlet opening on gas fired units to prevent moisture from entering the unit which could cause damage to electrical components. Allow this closure label to remain in place until the combustion air hood is to be installed (Refer to Figures 7).

RIGGING AND HANDLING

This unit is *not* designed to be handled with a fork-truck.

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching cable slings to the lifting lugs provided in the unit base rails. Spreaders MUST be used across the top of the unit. Refer to Figure 2.

- Rig with six cables and spread with three 98-inch spreaders across width of unit.
- Refer to Tables 8 and 11 for unit weight.
- Center of gravity includes economizer, exhaust or return air fan (Refer to Table 12).

TABLE 11: UNIT CORNERWEIGHT

UNIT DESCRIPTION	25 TON				30 TON				40 TON			
	A	B	C	D	A	B	C	D	A	B	C	D
Basic Unit	870	949	1352	1239	930	972	1360	1303	969	969	1454	1454
Basic Unit With Economizer	1018	1111	1313	1203	1076	1124	1328	1272	1058	1058	1482	1482
Basic Unit With Economizer and Gas or Electric Heat	994	1084	1418	1300	1073	1073	1403	1403	1102	1055	1503	1570
Basic Unit With Economizer and Gas or Electric Heat and Power Exhaust	1220	1275	1318	1262	1275	1275	1410	1410	1335	1278	1485	1551

NOTES: Basic Unit = cooling only, 10hp FC fan.
+ Econ = +235lb
+ Heat = single stage gas, 180 lb
+ Power Exhaust = modulating 7.5hp

TABLE 12: UNIT CENTER OF GRAVITY

MODEL	25 TON		30 TON		40 TON	
	X	Y	X	Y	X	Y
Basic Unit	99”	48”	100”	47”	96”	46"
Basic Unit /w Econ.	110”	48”	110”	47”	100”	46"
Basic Unit /w Econ. & Gas or Elect. Heat, Steam or Hot Water Heat	104”	48”	104”	46”	99”	45"
Basic Unit /w Econ. & Gas or Elect. Heat, & Power Exhaust	118”	47”	114”	46”	111”	45"

CLEARANCES

All units require certain clearances for proper operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with section 5.3, Air for Combustion and Ventilation of the National Fuel Gas Code ANSI Z223.1 or Sections 7.2, 7.3 or 7.4 of CAN/CGA B149 installation codes-Latest Edition and/or applicable provisions of the local building codes. Refer to Figure 8 for clearances required for combustible construction, servicing, and proper unit operation.

⚠ WARNING

(COOLING OPERATION) Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlets.

⚠WARNING

(GAS HEATING OPERATION)

Excessive exposure to contaminated combustion air will result in safety and performance related problems. To maintain combustion air quality, the recommended source of combustion air is the outdoor air supply.

The outdoor air supplied for combustion should be free from contaminants due to chemical exposure that may be present from the following sources:

- Commercial buildings
- Indoor pools
- Laundry rooms
- Hobby or craft rooms
- Chemical storage areas

The following substances should be avoided to maintain outdoor combustion air quality:

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine based swimming pool cleaners
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents (such as perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry acid washing materials

DUCTWORK

Ductwork should be designed and sized according to the methods in Manual Q of the Air Conditioning Contractors of America (ACCA).

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

When the unit is equipped with power exhaust fans or return air fan the return duct should have a 90 elbow before opening to the building space to abate noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

If the unit is equipped with hot water or steam heat then the supply air direction will be down only.

AIR HOODS FOR FIXED OUTSIDE AIR (UNITS WITH MANUAL ECONOMIZER)

These hoods are factory installed. The dampers may be adjusted by loosening the thumb screw, turning the lever to the desired position, and retightening the thumb screw.

AIR HOODS FOR ECONOMIZER

There are (3) economizer outside air intake hoods provided with the unit. The hood on the end of the unit is factory mounted. The (2) front and rear hoods are made operational per the following instructions.

Remove the screws holding the economizer hood shipping covers in place. Discard covers.

Rotate the hoods out (each hood is hinged in the lower corner). Secure the hoods with screws along the top and sides.

Apply a bead of RTV sealer along the edge of both hoods and each pivot joint to prevent water leakage.

Seal any unused screw holes with RTV or by replacing the screw.

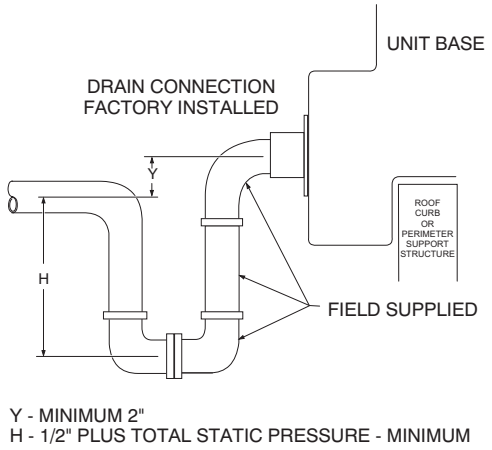
AIR HOODS FOR EXHAUST AIR

When furnished, these hoods and dampers are factory installed.

CONDENSATE DRAIN

There is one condensate drain connection. Trap the connection per Figure 4. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain lines from the 1-1/2 inch NPT female connections on the unit to an open drain.



Y - MINIMUM 2"
H - 1/2" PLUS TOTAL STATIC PRESSURE - MINIMUM

FIGURE 4 - RECOMMENDED DRAIN PIPING

SERVICE ACCESS

Access to all serviceable components is provided by the following hinged doors:

- Furnace compartment
- Supply Air Fan compartment Evaporator Coil compartment (three doors)
- Filter compartment economizer compartment (two doors)
- Power Exhaust compartment (two doors)
- Main control panels (one door)

Refer to Figure 1 for location of these access panels.

⚠ CAUTION

Make sure that all screws and panel latches are replaced and properly positioned on the unit to maintain an air-tight seal.

COMPRESSORS

Units are shipped with compressor mountings factory-adjusted and ready for operation.

⚠ CAUTION

DO NOT loosen compressor mounting bolts.

FILTERS

Throwaway or rigid filters are supplied with each unit. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters will reduce the capacity of the unit and will result in frosted coils or safety shutdown. Required filter sizes are shown in Table 15. The unit should not be operated without filters properly installed.

THERMOSTAT (CONSTANT VOLUME UNITS)

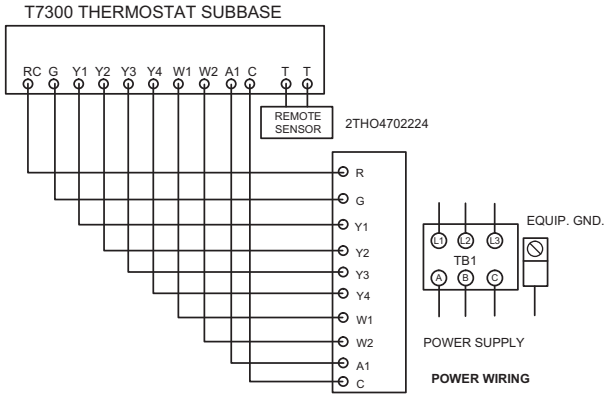


FIGURE 5 - TYPICAL THERMOSTAT WIRING

The thermostat, if used, should be located on an inside wall approximately 56 inches above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with sensor for general installation procedure (See Figure 5). Refer to Table 13 for control wire sizing and maximum length.

TABLE 13: CONTROL WIRE SIZES

WIRE SIZE	MAXIMUM LENGTH
20 AWG	100 Feet
18 AWG	150 Feet

SPACE SENSOR (VARIABLE AIR VOLUME UNITS)

The space sensor, if used, should be located on an inside wall approximately 56 inch above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with sensor for general installation procedure.

POWER AND CONTROL WIRING

Field wiring to the unit must conform to provisions of National Electrical Code (NEC) ANSI / NFPA 70-Latest Edition and / or local ordinances. The unit must be electrically grounded in accordance with the NEC and / or local codes. Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 1.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

Power supply to the unit must be NEC Class 1 and must comply with all applicable codes. A disconnect switch must be provided (factory option available). The switch must be separate from all other circuits. Wire entry at knockout openings requires conduit fittings to comply with NEC and/or Local Codes. Refer to Figures 11, 12, 13, and 14 for installation location of openings.

If installing a field mounted disconnect on the unit, refer to Figure 15 for the recommended mounting location. Unitstrut™ or equivalent rails should be mounted as shown to provide structure for mounting. The location of the rails should be adjusted to fit the disconnect within the dimensions shown. Conduit run from the disconnect to the power entry location in the baserail should be routed so that it does not interfere with the doors of the unit access panels.

⚠ CAUTION

Use care to avoid damage when drilling holes for the disconnect mounting.

NOTE: Since not all local codes allow mounting a disconnect on the unit, please confirm compliance with local code before mounting a disconnect on the unit.

Electrical wiring must be sized properly to carry the load. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

⚠ CAUTION

When connecting electrical power and control wiring to the unit, waterproof connectors MUST BE USED so that water or moisture cannot be drawn into the unit during normal operation. The above waterproofing conditions will also apply when installing a field-supplied disconnect switch.

Refer to Figure 5 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

POWER WIRING DETAIL

Units are factory wired for the voltage shown on the unit nameplate. The main power block requires copper wires. Refer to Electrical Data Tables 17 through 28 to size power wiring, fuses and disconnect switch. All field supplied wiring, fuses and disconnects must comply with applicable NEC codes.

Power wiring is brought into the unit through the side of the baserail or the bottom of the unit/control box inside the curb. The baserail has a 2-1/2” diameter hole for field wiring and a 3-5/8” hole is provided for a through-the-curb connection. A removable patch plate covers both the openings.

⚠ CAUTION

Waterproof connections MUST be used to ensure that water cannot penetrate the roof or roof curb.

ERV

The ERV [Energy Recovery Ventilation] is a separate air handler that attaches to the exhaust end of the 25-40T Series 40 packaged rooftop unit. The ERV is shipped separately and assembled to the Series 40 unit at the jobsite. An 'ERV' Series 40 is shipped with an end configuration and electric hookups designed to mate with the ERV. This option is available only with the standard control, and no other power exhaust option can be supplied if an ERV is selected.

The ERV incorporates a rotating heat exchange wheel and a pair of exhaust blowers. It exhausts return air through the wheel, capturing the thermal energy of the exiting hot or cold air as it passes. As the wheel rotates, the incoming airstream, pulled through by the supply fan, regains that energy.

The Series 40 ERV has a terminal block and mating connectors to simplify hooking up the two systems. The controls of both units are factory set to interact properly. Power for the ERV blower motors and controls is provided through the Series 40 unit. The Series 40 /ERV dataplate information includes the ERV electrical load.

The Series 40 standard control has parameters for the ERV; refer to the parameter list. When economizer and ERV options are selected on the same unit, the control and the ERV have specific connections and internal rules for that operation.

Also refer to the ERV Installation Instructions packaged with the ERV.

GAS HEATING

⚠WARNING

On VAV units with gas fired furnace, ALL INDIVIDUAL ROOM DAMPER BOXES MUST BE CONTROLLED FULL OPEN DURING HEATING OPERATION TO ENSURE PROPER AIRFLOW OVER THE FURNACE. A control contact powered by the "VAV OPEN" terminals on the standard control is provided for the damper box interlock. this contact is normally open, and is closed during heating operation.

GAS PIPING

Proper sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. National Fuel Gas Code Z223.1-Latest Edition should be followed in all cases unless superseded by local codes or gas company requirements. Refer to Table 14.

The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

TABLE 14: PIPE SIZES

LENGTH IN FEET	NOMINAL IRON PIPE, SIZE		
	1-1/4 IN.[1]	1-1/2 IN.[1]	2 IN.[1]
10	1,050	1,600	3,050
20	730	1,100	2,100
30	590	890	1,650
40	-	760	1,450
50	-	-	1,270
60	-	-	1,150
70	-	-	1,050
80	-	-	990

1. **Maximum capacity of pipe in cubic feet of gas per hour (based upon a pressure drop of 0.3 inch water column and 0.6 specific gravity gas.**

NOTE: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 1-1/4 inch pipe connection at the entrance fitting. Line should not be sized smaller than the entrance fitting size.

GAS CONNECTION

The gas supply line should be routed within the space and penetrate the roof at the gas inlet connection of the unit. Refer to Figures 11 through 14 to locate the access opening. Typical supply piping arrangements are shown in Figure 6.

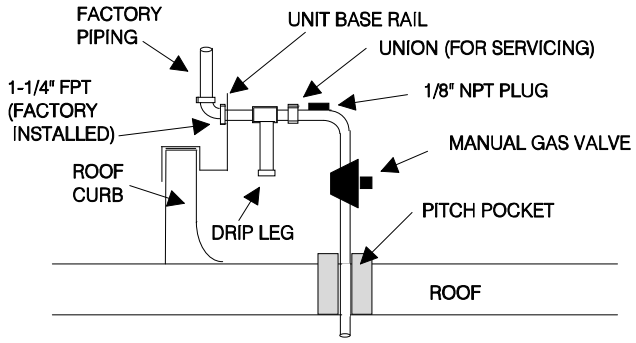


FIGURE 6 - TYPICAL GAS PIPING CONNECTION

Gas piping recommendations:

1. A drip leg and a ground joint union must be installed in the gas piping.

2. When required by local codes, a manual shut-off valve will have to be installed outside of the unit.

3. Use wrought iron or steel pipe for all gas lines. Pipe dope should be applied sparingly to male threads only.

⚠WARNING

Natural gas may contain some propane. Propane, is an excellent solvent and will quickly dissolve white lead or most standard commercial pipe sealing compounds. Therefore, special shellac base pipe dope compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clyde's or John Crane must be applied for wrought iron or steel pipe.

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out the loose particles. Before initial start-up, be sure that all of the gas lines external to the unit have been purged of air.

5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under Limitations. After the gas connections have been completed, open the main shutoff valve admitting normal gas pressure to the mains. Check all joints for leaks with soap solution or other material suitable for the purpose. NEVER USE A FLAME.

6. The furnace and its individual manual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 0.5 psig.

⚠ CAUTION

Disconnect gas piping from unit when leak testing at pressures greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced.

7. A 1/8 inch N.P.T. plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the furnace.

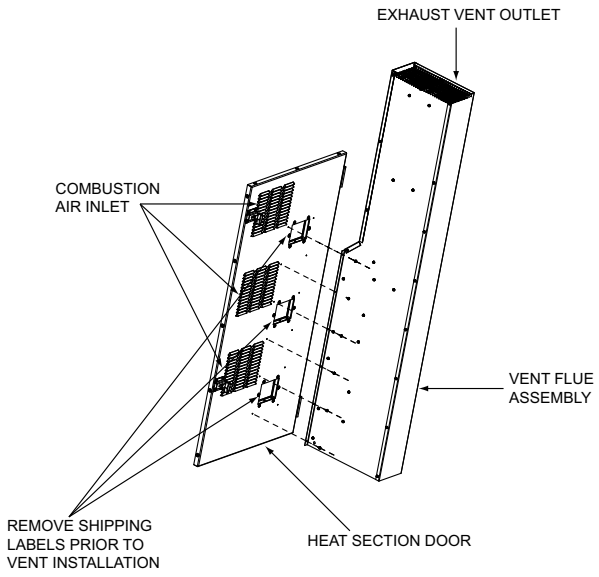


FIGURE 7 - VENT AND COMBUSTION AIR HOODS

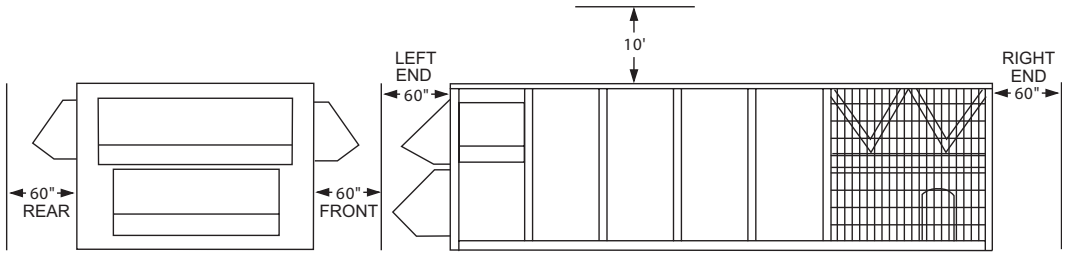
VENT AND COMBUSTION AIR

NOTE: All the hoods and hardware are shipped within the evaporator section. Each hood must be properly attached to the furnace doors to assure proper operation and compliance with CSA/ETL safety certification. (Refer to Figure 7.)

The products of combustion are discharged horizontally through hooded openings in the gas heat access doors.

(Figure 7)

1. Remove the shipping covers that are attached to the heat section door covering the flue outlets.
2. Locate the flue which is shipped in the evaporator section.
3. Place the flue over the flue outlet and attach with screws provided.
4. Refer to the Gas Furnace Operation Instruction in the Start-up Section of this manual for further instructions.



LEFT	60"
RIGHT	60"
REAR	60"
FRONT	60"
TOP	10'

NOTE: DO NOT use the unit roof to support any type of structure bracing.

FIGURE 8 - CLEARANCES

ELECTRIC HEAT

Units with electric heat are fully wired and operational when shipped. Constant volume units are designed for two equal steps of capacity for 80 and 108 kWH heat; 40 kW heat is one step only. Heat outputs on VAV units are all turned on together at full heat capacity.

HOT WATER HEAT

The Johnson Controls Series 40 units (25, 30, and 40 Ton sizes) can be furnished with a Unitary Products hot water coil as the heat source. One or two row coil units will be factory installed in the heating section.

NOTE: The hot water control valve will not be provided. The installer will need to provide a hot water control valve, to connect the hot water piping and power wiring at the job site for the hot water heat section to be operational.

⚠ CAUTION

DO NOT use hot water coils as steam coils under any circumstances.

All piping, control valves, and wiring that is field installed must be properly insulated and conform to all local and national codes.

NOTE: For all hot water coils the entering water temperature should not exceed 200°F.

The hot water coil is located downstream of the supply air fan and just above the supply air opening in the bottom of the unit.

Refer to Tables 50 through 58 and Figures 27 through 40 for flow rate and capacity.

⚠ CAUTION

There are no provisions in the coil or control sequence to prevent freezing of condensate. The control valve, piping and field installed wiring connections are particularly vulnerable because they are installed in the vestibule outside of the conditioned air stream. The installing party will be responsible for properly insulating and installing power and control wiring, to the actuator and piping.

In one row hot water coil systems DO NOT exceed a 40 gallons per minute flow rate.

In two row hot water coil systems DO NOT exceed an 80 gallons per minute flow rate.

Condensate will freeze on the control valve and piping if they are not properly insulated. Insulating the control valve and piping is the responsibility of the installing party.

PIPING CONNECTIONS

The hot water piping must enter the unit through the floor of the heat section compartment. The access doors to the compartment are gasketed so the compartment can be sealed. However, as added protection for water leakage into the space, the piping access holes should be sealed with a heat resistant mastic Figure 9 shows the location of the compartment and piping connections.

⚠ CAUTION

Piping access holes should be sealed with a heat resistant mastic to prevent damage to equipment.

⚠WARNING

DO NOT use tin based solder. Brazing with tin based solder could cause equipment damage or possible injury to tenants of the structure that is being conditioned.

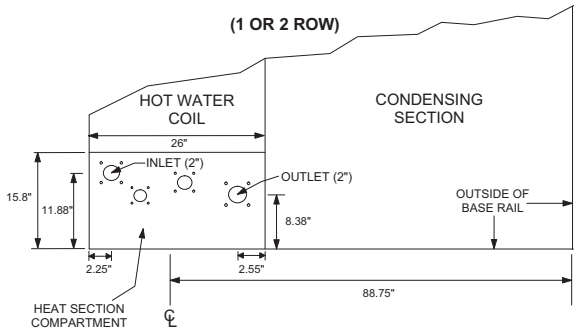


FIGURE 9 - HOT WATER PIPING CROSS-SECTION

STEAM HEAT

The Johnson Controls Series 40 units (25, 30 and 40 Ton sizes) can be furnished with a Unitary Products single row steam coil. The steam coils are a factory installed option.

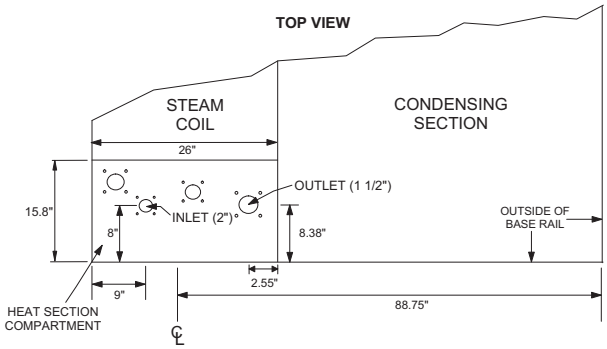


FIGURE 10 - STEAM PIPING CROSS-SECTION

NOTE: The steam control valve, power and control wiring to the actuator of the valve is the responsibility of the installing party.

⚠ CAUTION

All piping and control valves, and wiring that is field installed must be properly insulated and conform to all local and national codes.

There are no provisions in the coil or control sequence to prevent freezing of condensate. The control valve, piping and field installed wiring connections are particularly vulnerable because they are installed in the vestibule outside of the conditioned air stream. The installing party will be responsible for properly insulating and installing power and control wiring, to the actuator and piping.

DO NOT use steam coils as hot water coils under any circumstances.

In steam coil systems, the steam pressure shall not exceed 15 PSI.

PIPING CONNECTIONS

Refer to Tables 46 through 49 and Figures 41 and 42 for flow rate and capacity.

The steam piping must enter the unit through the floor of the heat section compartment. The access doors to the compartment are gasketed so the compartment can be sealed. However, as added protection for condensate leakage into the space, the piping access holes should be sealed with a heat resistant mastic. The following figure illustrates the location of the compartment and piping connections.

⚠ CAUTION

Piping access holes should be sealed with a heat resistant mastic to prevent damage to equipment.

⚠WARNING

DO NOT use tin based solder. Brazing with tin based solder could cause equipment damage or possible injury to tenants of the structure that is being conditioned.

STATIC PRESSURE CONTROL PLASTIC TUBING

On units with variable frequency drives (VFD's) or inlet guide vanes (IGV's) on the supply blower and/or power exhaust fans, pressure sensing tubing must be field supplied and installed. All tubing must be installed from the transducers (located in the unit) to the location in the building (or ductwork) where a constant pressure is desired. The tubing must also be installed from the transducers to a low-side reference to the atmosphere.

The supply air duct pressure sensor (DPS) is located in the control box directly below the Series 40 standard control. Plastic tubing (1/4") must be run from the high pressure tap of the transducer to a static pressure tap (field supplied) in the supply duct located at a point where constant pressure is desired. Tubing must also be run between the low pressure tap of the transducer to atmospheric pressure. Changing the adjustment is done to the duct pressure setpoint in the control.

EXHAUST STATIC PRESSURE

If a modulating-damper or variable frequency drive power exhaust is installed, there will be a building pressure sensor (BPS) in the control box directly below the Series 40 standard control. This ± .25 IWG/0-5VDC transducer sends a building pressure signal to the control. A sensing tube must be installed from a representative location in the building to the HI port of the transducer. Tubing must also be run between the low pressure tap of the transducer to atmospheric pressure.

Changing the adjustment is done to the building pressure setpoint in the control.

⚠ CAUTION

Do not run plastic tubes in the supply or return air ducts as air movement could cause erroneous sensing. If tubes penetrate bottom of unit be sure openings are sealed against air and water leakage.

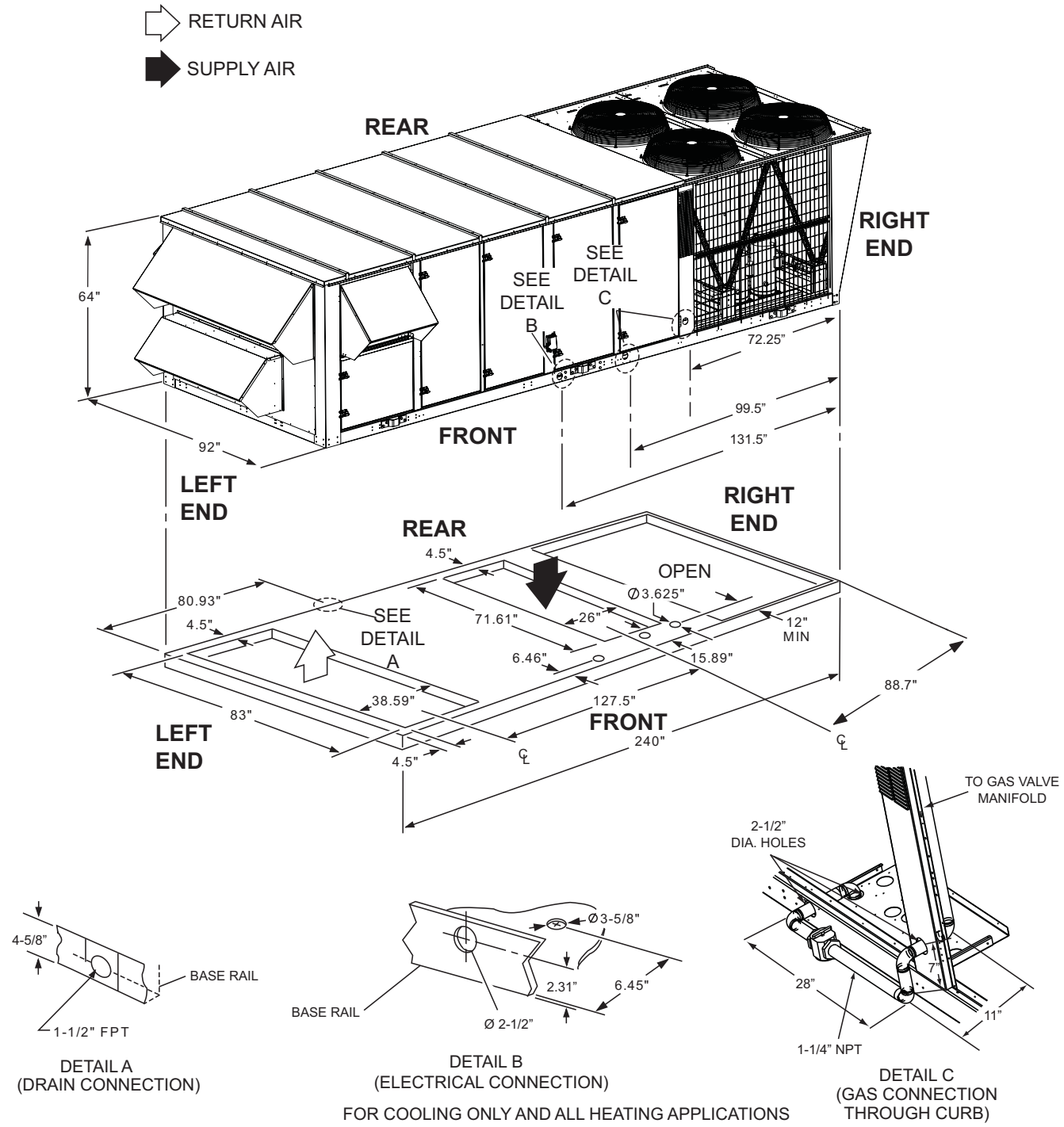


FIGURE 11 - BOTTOM SUPPLY AND RETURN

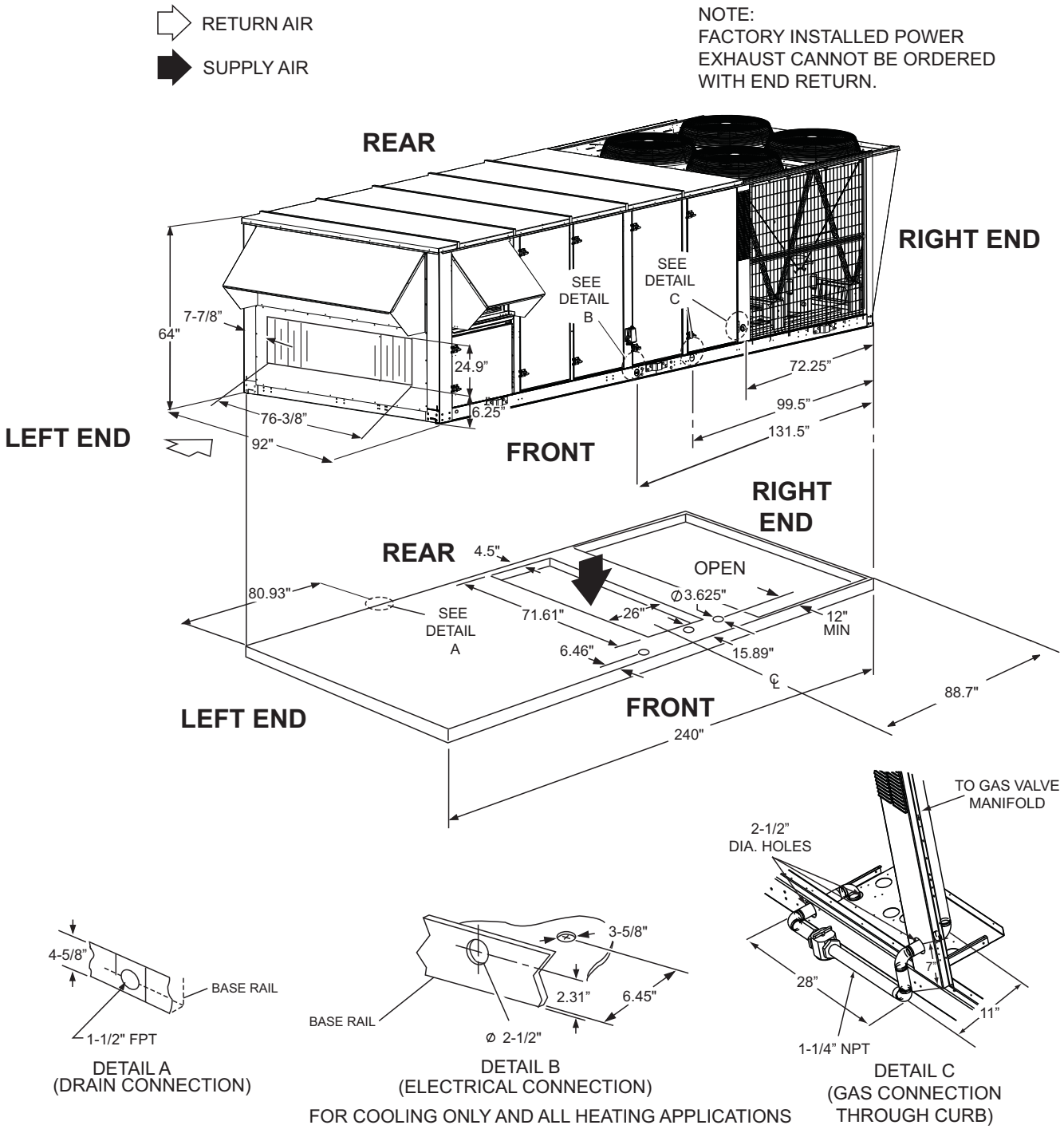


FIGURE 12 - END RETURN, BOTTOM SUPPLY

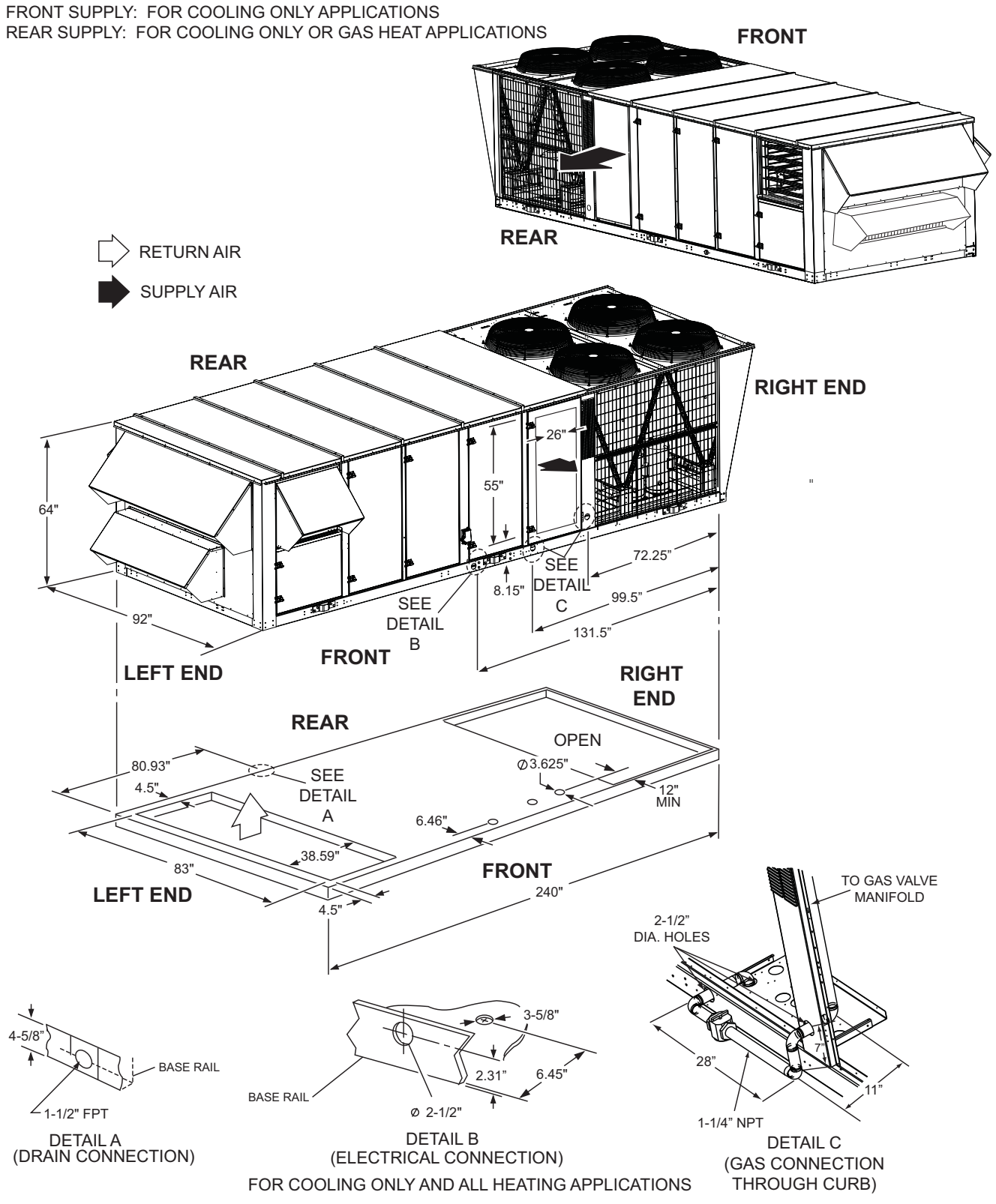


FIGURE 13 - BOTTOM RETURN, FRONT & REAR SUPPLY

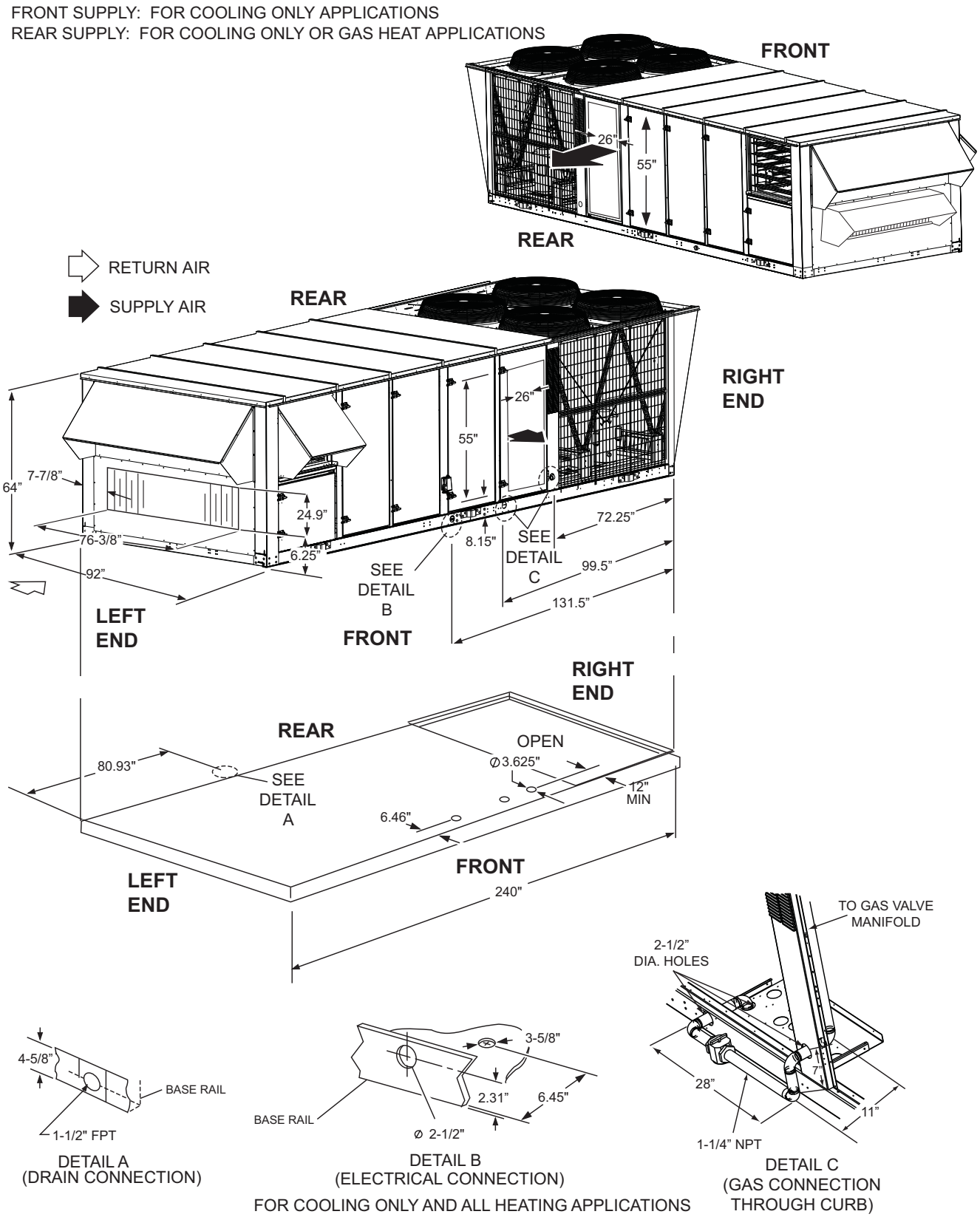


FIGURE 14 - END RETURN, FRONT & REAR SUPPLY

TABLE 15: GENERAL PHYSICAL DATA

Unit Size	25 TON	30 TON	40 TON
Unit EER / IPLV (Standard Capacity Evaporator)	10.5 / 12.3	10.1[1] / 11.0	10.1[1] / 11.0
Compressor Data			
Number/Size	4 x 5.7Ton	4 x 7 Ton	4 x 8.6 Ton
Type	Scroll	Scroll	Scroll
Unit Capacity Steps	25%, 50%, 75%, 100%	25%, 50%, 75%, 100%	25%, 50%, 75%, 100%
Indoor Fan and Drive			
Number / Type	1 / FC	1 / FC	1 / FC
Diameter x Width (inches)	22 x20	22 x 20	25 x 22
HP Range	7.5 - 20	10 - 25	10 - 25
CFM Range (full load)	6,000 - 12,500	6,000 - 15,000	8,000 - 18,000
ESP Range	0.2" - 4.0"	0.2" - 4.0"	0.2" - 4.0"
Exhaust Fan			
Number/Size/Type	1/FC	2/FC	2/FC
HP Range (single motor)	5 - 10	7.5 - 15	7.5 - 15
CFM	3,000 - 9,000	4,000 - 15,000	4,000 - 18,000
Evaporator Coil			
Size (sq. ft.)	26.0	26.0	30.4
Rows/FPI	3 / 16	4 / 16	4 / 16
Condenser Coil			
Size (sq. ft.)	65	78	104
Rows/FPI	2/16	2 /16	2 /16
Condenser Fans			
Quantity / Diameter (inches)	4 / 24	4 / 24	4 / 30
Nominal CFM	6,800	7,200	9,600
Motor HP	1.0	1.5	1.5
Electric Heat			
kW Range	40 - 108	40 - 108	40 - 108
40 kW / Capacity Steps (CV/VAV)	1	1	1
80 kW / Capacity Steps (CV/VAV)	2 / 1	2 / 1	2 / 1
108 kW / Capacity Steps (CV/VAV)	3 / 1[2]	3 / 1[2]	3 / 1[2]
Natural Gas Heat			
Unit Size	**25 TON**	**30 TON**	**40 TON**
267 MBH Capacity Steps (CV/VAV)	1 / 1	1 / 1	1 / 1
533 MBH Capacity Steps (CV/VAV)	2 / 1	2 / 1	2 / 1
800 MBH Capacity Steps (CV/VAV)	-	-	3 / 1[2]
267 MBH "Modulating" Capacity Steps (CV Only)	6 / 1	6 / 1	6 / 1
533 MBH "Modulating" Capacity Steps (CV Only)	12 / 2	12 / 2	12 / 2
800 MBH "Modulating" Capacity Steps (CV Only)	-	-	17 / 3
Hot Water Coil			
Size (inches)	22.5" x 65"	22.5" X 65"	22.5" X 65"
Capacity	25 Ton	30 Ton	40 Ton
Steam Coil			
Size (inches)	21" X 65"		
Type	Steam Coil		
Filters 2" TA			
Number / Size	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25
Face Area (sq. ft.)	30.4	30.4	30.4
Filters 2" Pleated, 30%			
Number / Size	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25
Face Area (sq. ft.)	30.4	30.4	30.4
Filters 65% Rigid w/ 2" TA Prefilters			
Number / Size	4 / 16 x 25 & 6 / 20 x 25	4 /16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25
Face Area (sq. ft.)	30.4	30.4	30.4
Filters 95% Rigid w/ 2" TA Prefilters			
Number / Size	4 ea. 16 x 25 / 6 ea. 20 x 25	4 ea. 16 x 25 / 6 ea. 20 x 25	4 ea. 16 x 25 / 6 ea. 20 x 25
Face Area (sq. ft.)	30.4	30.4	30.4

1. Cooling Only Unit Efficiency/ Gas Electric Unit Efficiency is 10.0/10.6
2. Unit Control Board with 3 heating outputs only, all other Unit Control Boards 2 / 1.

TABLE 16: REFRIGERANT FACTORY CHARGE R-410A

UNIT (TONS)	MODEL	CHARGE			
		SYSTEM #1	SYSTEM #2	SYSTEM #3	SYSTEM #4
25	wo/HGBP	13lb 8oz	12lb 8oz	12lb 8oz	12lb 8oz
25	w/HGBP	14lb	12lb 8oz	12lb 8oz	12lb 8oz
30	wo/HGBP	16lb	16lb 8oz	14lb	18lb 4oz
30	w/HGBP	16lb 8oz	17lb	14lb 8oz	18lb 12oz
40	wo/HGBP	17lb 10oz	17lb 10oz	19lb 13oz	19lb 13oz
40	w/HGBP	18lb 2oz	18lb 2oz	20lb 5oz	20lb 5oz

TABLE 17: ELECTRICAL DATA 25 TON BASIC UNIT R-410A

Voltage	Compressors (each)				OD Fan Motors		Supply Blower Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA		
208-3-60	4	22.4	149	35	4	4.5	7.5	24.2	138	150
							10	30.8	146	175
							15	46.2	165	200
							20	59.4	182	225
230-3-60	4	22.4	149	35	4	4.3	7.5	22	134	150
							10	28	142	150
							15	42	159	200
							20	54	174	225
460-3-60	4	10.6	75	16.5	4	2.15	7.5	11	65	70
							10	14	69	80
							15	21	77	90
							20	27	85	110
575-3-60	4	7.7	54	12	4	1.7	7.5	9	49	50
							10	11	51	60
							15	17	59	70
							20	22	65	80

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 18: ELECTRICAL DATA 30 TON BASIC UNIT R-410A

Voltage	Compressors (each)				OD Fan Motors		Supply Blower Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA		
208-3-60	4	25.0	164	39	4	5.8	10	30.8	162	175
							15	46.2	181	225
							25	74.8	217	250
							20	59.4	197	250
230-3-60	4	25.0	164	39	4	5.8	10	28	158	175
							15	42	176	200
							25	68	208	250
							20	54	191	225
460-3-60	4	12.0	100	19	4	2.9	10	14	77	90
							15	21	86	100
							20	27	93	110
							25	34	102	125
575-3-60	4	9.0	78	14	4	2.2	10	11	59	60
							15	17	66	80
							20	22	72	90
							25	27	79	100

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 19: ELECTRICAL DATA 40 TON BASIC UNIT R-410A

Voltage	Compressors (each)				OD Fan Motors		Supply Blower Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA		
208-3-60	4	30.1	255	47	4	5.8	10	30.8	182	200
							15	46.2	201	225
							20	59.4	218	250
							25	74.8	237	300
230-3-60	4	30.1	255	47	4	5.8	10	28	179	200
							15	42	196	225
							20	54	211	250
							25	68	229	250
460-3-60	4	16.7	114	26	4	2.9	10	14	97	110
							15	21	105	125
							20	27	112	125
							25	34	121	150
575-3-60	4	12.2	80	19	4	2.2	10	11	72	80
							15	17	79	90
							20	22	85	100
							25	27	91	110

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 20: ELECTRICAL DATA 25 TON W/ELECTRIC HEAT R-410A

Voltage	Compressors (each)				OD Fan Motors (each)	Supply Blower Motor		Electric Heat Option					MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	FLA	HP	FLA	Option	KW	Applied	Stages	Amps		
208-3-60	4	22.4	149	35	4.5	7.5	24.2	E4	40	30	1	83	138	150
						10	30.8						146	175
						15	46.2						165	200
						20	59.4						182	225
						7.5	24.2	E8	80	60	2	167	197	225
						10	30.8						205	225
						15	46.2						225	250
						20	59.4						241	300
230-3-60	4	22.4	149	35	4.3	7.5	22	E4	40	36.8	1	92	143	150
						10	28						150	150
						15	42						168	200
						20	54						183	225
						7.5	22	E8	80	73.6	2	184	212	250
						10	28						220	250
						15	42						237	250
						20	54						252	300
460-3-60	4	10.6	75	16.5	2.15	7.5	11	E4	40	36.8	1	46	71	80
						10	14						75	80
						15	21						84	90
						20	27						91	110
						7.5	11	E8	80	73.6	2	92	106	125
						10	14						110	125
						15	21						119	125
						20	27						126	150
						7.5	11	E1	108	99.4	3	125	138	150
						10	14						142	175
						15	21						151	175
						20	27						158	175
575-3-60	4	7.7	54	12	1.7	7.5	9	E4	40	36.8	1	40	62	70
						10	11						64	70
						15	17						72	80
						20	22						78	80
						7.5	9	E8	80	73.6	2	80	92	110
						10	11						94	110
						15	17						102	110
						20	22						108	125
						7.5	9	E1	108	99.4	3	108	120	150
						10	11						122	150
						15	17						130	150
						20	22						136	150

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 21: ELECTRICAL DATA 30 TON W/ELECTRIC HEAT R-410A

Voltage	Compressors (each)				OD Fan Motors (each)	Supply Blower Motor		Electric Heat Option					MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	FLA	HP	FLA	Option	KW	Applied	Stages	Amps		
208-3-60	4	25.0	164	39	5.8	10	30.8	E4	40	30	1	83	162	175
						15	46.2						181	225
						20	59.4						197	250
						25	74.8						217	250
						10	30.8	E8	80	60	2	167	205	225
						15	46.2						225	250
						20	59.4						241	300
						25	74.8						260	300
230-3-60	4	25.0	164	39	5.8	10	28	E4	40	36.8	1	92	158	175
						15	42						176	200
						20	54						191	225
						25	68						208	250
						10	28	E8	80	73.6	2	184	220	250
						15	42						237	250
						20	54						252	300
						25	68						270	300
460-3-60	4	12.0	100	19	2.9	10	14	E4	40	36.8	1	46	77	90
						15	21						86	100
						20	27						93	110
						25	34						102	125
						10	14	E8	80	73.6	2	92	110	125
						15	21						119	125
						20	27						126	150
						25	34						135	150
						10	14	E1	108	99.4	3	125	142	175
						15	21						151	175
						20	27						158	175
						25	34						167	200
575-3-60	4	9.0	78	14	2.2	10	11	E4	40	36.8	1	40	64	70
						15	17						72	80
						20	22						78	90
						25	27						84	100
						10	11	E8	80	73.6	2	80	94	110
						15	17						102	110
						20	22						108	125
						25	27						114	125
						10	11	E1	108	99.4	3	108	122	150
						15	17						130	150
						20	22						136	150
						25	27						142	150

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 22: ELECTRICAL DATA 40 TON W/ELECTRIC HEAT R-410A

Voltage	Compressors (each)				OD Fan Motors (each)	Supply Blower Motor		Electric Heat Option					MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	FLA	HP	FLA	Option	KW	Applied	Stages	Amps		
208-3-60	4	30.1	255	47	5.8	10	30.8	E4	40	30	1	83	182	200
						15	46.2						201	225
						20	59.4						218	250
						25	74.8						237	300
						10	30.8	E8	80	60	2	167	205	225
						15	46.2						225	250
						20	59.4						241	300
						25	74.8						260	300
230-3-60	4	30.1	255	47	5.8	10	28	E4	40	36.8	1	92	179	200
						15	42						196	225
						20	54						211	250
						25	68						229	250
						10	28	E8	80	73.6	2	184	220	250
						15	42						237	250
						20	54						252	300
						25	68						270	300
460-3-60	4	16.7	114	26	2.9	10	14	E4	40	36.8	1	46	97	110
						15	21						105	125
						20	27						112	125
						25	34						121	150
						10	14	E8	80	73.6	2	92	110	125
						15	21						119	125
						20	27						126	150
						25	34						135	150
						10	14	E1	108	99.4	3	125	142	175
						15	21						151	175
						20	27						158	175
						25	34						167	200
575-3-60	4	12.2	80	19	2.2	10	11	E4	40	36.8	1	40	72	80
						15	17						79	90
						20	22						85	100
						25	27						91	110
						10	11	E8	80	73.6	2	80	94	110
						15	17						102	110
						20	22						108	125
						25	27						114	125
						10	11	E1	108	99.4	3	108	122	150
						15	17						130	150
						20	22						136	150
						25	27						142	150

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 23: ELECTRICAL DATA 25 TON W/POWER EXHAUST R-410A

Voltage	Compressors (each)				OD Fan Motors (each)	Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	FLA	HP	FLA	HP	FLA		
208-3-60	4	22.4	149	35	4.5	7.5	24.2	5	16.7	155	175
								7.5	24.2	162	175
								10	30.8	170	200
						10	30.8	5	16.7	163	175
								7.5	24.2	170	200
								10	30.8	177	200
						15	46.2	5	16.7	182	225
								7.5	24.2	190	225
								10	30.8	196	225
						20	59.4	5	16.7	199	250
								7.5	24.2	206	250
								10	30.8	213	250
230-3-60	4	22.4	149	35	4.3	7.5	22	5	15.2	150	150
								7.5	22	156	175
								10	28	164	175
						10	28	5	15.2	157	175
								7.5	22	164	175
								10	28	170	175
						15	42	5	15.2	175	200
								7.5	22	181	200
								10	28	187	225
						20	54	5	15.2	190	225
								7.5	22	196	250
								10	28	202	250
460-3-60	4	10.6	75	16.5	2.15	7.5	11	5	7.6	72	80
								7.5	11	76	80
								10	14	80	90
						10	14	5	7.6	76	90
								7.5	11	80	90
								10	14	83	90
						15	21	5	7.6	85	100
								7.5	11	88	100
								10	14	91	110
						20	27	5	7.6	92	110
								7.5	11	96	110
								10	14	99	125
575-3-60	4	7.7	54	12	1.7	7.5	9	5	6.1	55	60
								7.5	9	58	60
								10	11	60	70
						10	11	5	6.1	57	60
								7.5	9	60	70
								10	11	62	70
						15	17	5	6.1	65	80
								7.5	9	68	80
								10	11	70	80
						20	22	5	6.1	71	90
								7.5	9	74	90
								10	11	76	90

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 24: ELECTRICAL DATA 30 TON W/POWER EXHAUST R-410A

Voltage	Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
208-3-60	4	25.0	164	39	4	5.8	10	30.8	7.5	24.2	186	200
									10	30.8	193	200
									15	46.2	212	250
							15	46.2	7.5	24.2	205	250
									10	30.8	212	250
									15	46.2	227	250
							20	59.4	7.5	24.2	222	250
									10	30.8	228	250
									15	46.2	244	300
							25	74.8	7.5	24.2	241	300
									10	30.8	248	300
									15	46.2	263	300
230-3-60	4	25.0	164	39	4	5.8	10	28	7.5	22	180	200
									10	28	186	200
									15	42	204	225
							15	42	7.5	22	198	225
									10	28	204	225
									15	42	218	250
							20	54	7.5	22	213	250
									10	28	219	250
									15	42	233	250
							25	68	7.5	22	230	250
									10	28	236	300
									15	42	250	300
460-3-60	4	12.0	100	19	4	2.9	10	14	7.5	11	88	100
									10	14	91	100
									15	21	100	110
							15	21	7.5	11	97	110
									10	14	100	110
									15	21	107	125
							20	27	7.5	11	104	125
									10	14	107	125
									15	21	114	125
							25	34	7.5	11	113	125
									10	14	116	150
									15	21	123	150
575-3-60	4	9.0	78	14	4	2.2	10	11	7.5	9	68	70
									10	11	70	80
									15	17	77	90
							15	17	7.5	9	75	90
									10	11	77	90
									15	17	83	100
							20	22	7.5	9	81	100
									10	11	83	100
									15	17	89	110
							25	27	7.5	9	88	110
									10	11	90	110
									15	17	96	110

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 25: ELECTRICAL DATA 40 TON W/POWER EXHAUST R-410A

Voltage	Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
208-3-60	4	30.1	225	47.0	4	5.8	10	30.8	7.5	24	206	225
									10	31	213	225
									15	46	232	250
							15	46.2	7.5	24	226	250
									10	31	232	250
									15	46	248	250
							20	59.4	7.5	24	242	300
									10	31	249	300
									15	46	264	300
							25	74.8	7.5	24	261	300
									10	31	268	300
									15	46	283	350
230-3-60	4	30.1	225	47.0	4	5.2	10	28.0	7.5	22	199	225
									10	28	205	225
									15	42	222	250
							15	42.0	7.5	22	216	250
									10	28	222	250
									15	42	236	250
							20	54.0	7.5	22	231	250
									10	28	237	250
									15	42	251	300
							25	68.0	7.5	22	248	300
									10	28	254	300
									15	42	268	300
460-3-60	4	16.7	114	26.0	4	2.6	10	14.0	7.5	11	108	110
									10	14	111	125
									15	21	119	125
							15	21.0	7.5	11	116	125
									10	14	119	125
									15	21	126	150
							20	27.0	7.5	11	123	150
									10	14	126	150
									15	21	133	150
							25	34.0	7.5	11	132	150
									10	14	135	150
									15	21	142	175
575-3-60	4	12.2	80	19.0	4	2.2	10	11.0	7.5	9	81	90
									10	11	83	90
									15	17	90	100
							15	17.0	7.5	9	88	100
									10	11	90	100
									15	17	96	110
							20	22.0	7.5	9	94	110
									10	11	96	110
									15	17	102	110
							25	27.0	7.5	9	100	125
									10	11	102	125
									15	17	108	125

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 26: ELECTRICAL DATA 25 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
208-3-60	E4	40	1	83	4	22.4	149	35	4	4.5	7.5	24.2	5	16.7	155	175
													7.5	24.2	162	175
													10	30.8	170	200
											10	30.8	5	16.7	163	175
													7.5	24.2	170	200
													10	30.8	177	200
											15	46.2	5	16.7	182	225
													7.5	24.2	190	225
													10	30.8	196	225
											20	59.4	5	16.7	199	250
													7.5	24.2	206	250
													10	30.8	213	250
	E8	80	2	167	4	22.4	149	35	4	4.5	7.5	24.2	5	16.7	214	225
													7.5	24.2	221	225
													10	30.8	230	250
											10	30.8	5	16.7	222	250
													7.5	24.2	230	250
													10	30.8	236	250
											15	46.2	5	16.7	241	250
													7.5	24.2	249	250
													10	30.8	256	300
											20	59.4	5	16.7	258	300
													7.5	24.2	265	300
													10	30.8	272	300
230-3-60	E4	40	1	92	4	22.4	149	35	4	4.3	7.5	22	5	15.2	158	175
													7.5	22	165	175
													10	28	172	175
											10	28	5	15.2	166	175
													7.5	22	172	175
													10	28	178	200
											15	42	5	15.2	183	200
													7.5	22	190	200
													10	28	196	225
											20	54	5	15.2	198	225
													7.5	22	205	250
													10	28	211	250
	E8	80	2	184	4	22.4	149	35	4	4.3	7.5	22	5	15.2	227	250
													7.5	22	234	250
													10	28	242	250
											10	28	5	15.2	235	250
													7.5	22	242	250
													10	28	248	250
											15	42	5	15.2	252	300
													7.5	22	259	300
													10	28	265	300
											20	54	5	15.2	267	300
													7.5	22	274	300
													10	28	280	300

TABLE 26: ELECTRICAL DATA 25 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A (CONTINUED)

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
460-3-60	E4	40	1	46	4	10.6	75	16.5	4	2.15	7.5	11	5	7.6	79	80
													7.5	11	82	90
													10	14	86	90
											10	14	5	7.6	83	90
													7.5	11	86	90
													10	14	89	90
											15	21	5	7.6	92	100
													7.5	11	95	100
													10	14	98	110
											20	27	5	7.6	99	110
													7.5	11	102	110
													10	14	105	125
	E8	80	2	92	4	10.6	75	16.5	4	2.15	7.5	11	5	7.6	114	125
													7.5	11	117	125
													10	14	121	125
											10	14	5	7.6	117	125
													7.5	11	121	125
													10	14	124	125
											15	21	5	7.6	126	150
													7.5	11	130	150
													10	14	133	150
											20	27	5	7.6	134	150
													7.5	11	137	150
													10	14	140	150
	E1	108	3	125	4	10.6	75	16.5	4	2.15	7.5	11	5	7.6	146	175
													7.5	11	149	175
													10	14	153	175
											10	14	5	7.6	150	175
													7.5	11	153	175
													10	14	156	175
											15	21	5	7.6	158	175
													7.5	11	162	175
													10	14	165	175
											20	27	5	7.6	166	175
													7.5	11	169	175
													10	14	172	175

TABLE 26: ELECTRICAL DATA 25 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A (CONTINUED)

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
575-3-60	E4	40	1	40	4	7.7	54	12	4	1.7	7.5	9	5	6.1	68	70
													7.5	9	71	70
													10	11	73	80
											10	11	5	6.1	70	70
													7.5	9	73	80
													10	11	75	80
											15	17	5	6.1	78	80
													7.5	9	81	90
													10	11	83	90
											20	22	5	6.1	84	90
													7.5	9	87	90
													10	11	89	100
	E8	80	2	80	4	7.7	54	12	4	1.7	7.5	9	5	6.1	98	110
													7.5	9	101	110
													10	11	103	110
											10	11	5	6.1	100	110
													7.5	9	103	110
													10	11	105	110
											15	17	5	6.1	108	110
													7.5	9	111	125
													10	11	113	125
											20	22	5	6.1	114	125
													7.5	9	117	125
													10	11	119	125
	E1	108	3	108	4	4	7.7	54	12	4	7.5	9	5	6.1	126	150
													7.5	9	129	150
													10	11	131	150
											10	11	5	6.1	128	150
													7.5	9	131	150
													10	11	133	150
											15	17	5	6.1	136	150
													7.5	9	139	150
													10	11	141	150
											20	22	5	6.1	142	150
													7.5	9	145	150
													10	11	147	150

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 27: ELECTRICAL DATA 30 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
208-3-60	E4	40	1	83	4	25.0	164	39	4	5.8	10	30.8	7.5	24.2	186	200
													10	30.8	193	200
													15	46.2	212	250
											15	46.2	7.5	24.2	205	250
													10	30.8	212	250
													15	46.2	227	250
											20	59.4	7.5	24.2	222	250
													10	30.8	228	250
													15	46.2	244	300
											25	74.8	7.5	24.2	241	300
													10	30.8	248	300
													15	46.2	263	300
	E8	80	2	167	4	25.0	164	39	4	5.8	10	30.8	7.5	24.2	230	250
													10	30.8	236	250
													15	46.2	256	300
											15	46.2	7.5	24.2	249	250
													10	30.8	256	300
													15	46.2	271	300
											20	59.4	7.5	24.2	265	300
													10	30.8	272	300
													15	46.2	287	300
											25	74.8	7.5	24.2	285	350
													10	30.8	291	350
													15	46.2	307	350
230-3-60	E4	40	1	92	4	25.0	164	39	4	5.8	10	28	7.5	22	180	200
													10	28	186	200
													15	42	204	225
											15	42	7.5	22	198	225
													10	28	204	225
													15	42	218	250
											20	54	7.5	22	213	250
													10	28	219	250
													15	42	233	250
											25	68	7.5	22	230	250
													10	28	236	300
													15	42	250	300
	E8	80	2	184	4	25.0	164	39	4	5.8	10	28	7.5	22	242	250
													10	28	248	250
													15	42	265	300
											15	42	7.5	22	259	300
													10	28	265	300
													15	42	279	300
											20	54	7.5	22	274	300
													10	28	280	300
													15	42	294	300
											25	68	7.5	22	292	350
													10	28	298	350
													15	42	312	350

TABLE 27: ELECTRICAL DATA 30 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A (CONTINUED)

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
460-3-60	E4	40	1	46	4	12.0	100	19	4	2.9	10	14	7.5	11	88	100
													10	14	91	100
													15	21	100	110
											15	21	7.5	11	97	110
													10	14	100	110
													15	21	107	125
											20	27	7.5	11	104	125
													10	14	107	125
													15	21	114	125
											25	34	7.5	11	113	125
													10	14	116	150
													15	21	123	150
	E8	80	2	92	4	12.0	100	19	4	2.9	10	14	7.5	11	121	125
													10	14	124	125
													15	21	133	150
											15	21	7.5	11	130	150
													10	14	133	150
													15	21	140	150
											20	27	7.5	11	137	150
													10	14	140	150
													15	21	147	150
											25	34	7.5	11	146	175
													10	14	149	175
													15	21	156	175
	E1	108	3	125	4	12.0	100	19	4	2.9	10	14	7.5	11	153	175
													10	14	156	175
													15	21	165	175
											15	21	7.5	11	162	175
													10	14	165	175
													15	21	172	175
											20	27	7.5	11	169	175
													10	14	172	175
													15	21	179	200
											25	34	7.5	11	178	200
													10	14	181	200
													15	21	188	200

TABLE 27: ELECTRICAL DATA 30 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A (CONTINUED)

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
575-3-60	E4	40	1	40	4	9.0	78	14	4	2.2	10	11	7.5	9	73	80
													10	11	75	80
													15	17	83	90
											15	17	7.5	9	81	90
													10	11	83	90
													15	17	89	100
											20	22	7.5	9	87	100
													10	11	89	100
													15	17	95	110
											25	27	7.5	9	93	110
													10	11	95	110
													15	17	101	110
	E8	80	2	80	4	9.0	78	14	4	2.2	10	11	7.5	9	103	110
													10	11	105	110
													15	17	113	125
											15	17	7.5	9	111	125
													10	11	113	125
													15	17	119	125
											20	22	7.5	9	117	125
													10	11	119	125
													15	17	125	125
											25	27	7.5	9	123	150
													10	11	125	150
													15	17	131	150
	E1	108	3	108	4	9.0	78	14	4	2.2	10	11	7.5	9	131	150
													10	11	133	150
													15	17	141	150
											15	17	7.5	9	139	150
													10	11	141	150
													15	17	147	150
											20	22	7.5	9	145	150
													10	11	147	150
													15	17	153	175
											25	27	7.5	9	151	175

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

TABLE 28: ELECTRICAL DATA 40 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
208-3-60	E4	40	1	83	4	30.1	255	47	4	5.8	10	30.8	7.5	24.2	206	225
													10	30.8	213	225
													15	46.2	232	250
											15	46.2	7.5	24.2	226	250
													10	30.8	232	250
													15	46.2	248	250
											20	59.4	7.5	24.2	242	300
													10	30.8	249	300
													15	46.2	264	300
											25	74.8	7.5	24.2	261	300
													10	30.8	268	300
													15	46.2	283	350
	E8	80	2	167	4	30.1	255	47	4	5.8	10	30.8	7.5	24.2	230	250
													10	30.8	236	250
													15	46.2	256	300
											15	46.2	7.5	24.2	249	250
													10	30.8	256	300
													15	46.2	271	300
											20	59.4	7.5	24.2	265	300
													10	30.8	272	300
													15	46.2	287	300
											25	74.8	7.5	24.2	285	350
													10	30.8	291	350
													15	46.2	307	350
230-3-60	E4	40	1	92	4	30.1	255	47	4	5.8	10	28	7.5	22	201	225
													10	28	207	225
													15	42	224	250
											15	42	7.5	22	218	250
													10	28	224	250
													15	42	238	250
											20	54	7.5	22	233	250
													10	28	239	250
													15	42	253	300
											25	68	7.5	22	251	300
													10	28	257	300
													15	42	271	300
	E8	80	2	184	4	30.1	255	47	4	5.8	10	28	7.5	22	242	250
													10	28	248	250
													15	42	265	300
											15	42	7.5	22	259	300
													10	28	265	300
													15	42	279	300
											20	54	7.5	22	274	300
													10	28	280	300
													15	42	294	300
											25	68	7.5	22	292	350
													10	28	298	350
													15	42	312	350

TABLE 28: ELECTRICAL DATA 40 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A (CONTINUED)

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
460-3-60	E4	40	1	46	4	16.7	114	26	4	2.9	10	14	7.5	11	108	110
													10	14	111	125
													15	21	119	125
											15	21	7.5	11	116	125
													10	14	119	125
													15	21	126	150
											20	27	7.5	11	123	150
													10	14	126	150
													15	21	133	150
											25	34	7.5	11	132	150
													10	14	135	150
													15	21	142	175
	E8	80	2	92	4	16.7	114	26	4	2.9	10	14	7.5	11	121	125
													10	14	124	125
													15	21	133	150
											15	21	7.5	11	130	150
													10	14	133	150
													15	21	140	150
											20	27	7.5	11	137	150
													10	14	140	150
													15	21	147	150
											25	34	7.5	11	146	175
													10	14	149	175
													15	21	156	175
	E1	108	3	125	4	16.7	114	26	4	2.9	10	14	7.5	11	153	175
													10	14	156	175
													15	21	165	175
											15	21	7.5	11	162	175
													10	14	165	175
													15	21	172	175
											20	27	7.5	11	169	175
													10	14	172	175
													15	21	179	200
											25	34	7.5	11	178	200
													10	14	181	200
													15	21	188	200

TABLE 28: ELECTRICAL DATA 40 TON W/ELECTRIC HEAT AND POWER EXHAUST R-410A (CONTINUED)

Voltage	Electric Heat Option				Compressors (each)				OD Fan Motors (each)		Supply Blower Motor		Pwr Exh Motor		MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
	Model	KW	Stages	Amps	Qty	RLA	LRA	MCC	Qty	FLA	HP	FLA	HP	FLA		
575-3-60	E4	40	1	40	4	12.2	80	19	4	2.2	10	11	7.5	9	81	90
													10	11	83	90
													15	17	90	100
											15	17	7.5	9	88	100
													10	11	90	100
													15	17	96	110
											20	22	7.5	9	94	110
													10	11	96	110
													15	17	102	110
											25	27	7.5	9	100	125
													10	11	102	125
													15	17	108	125
	E8	80	2	80	4	12.2	80	19	4	2.2	10	11	7.5	9	103	110
													10	11	105	110
													15	17	113	125
											15	17	7.5	9	111	125
													10	11	113	125
													15	17	119	125
											20	22	7.5	9	117	125
													10	11	119	125
													15	17	125	125
											25	27	7.5	9	123	150
													10	11	125	150
													15	17	131	150
	E1	108	3	108	4	12.2	80	19	4	2.2	10	11	7.5	9	131	150
													10	11	133	150
													15	17	141	150
											15	17	7.5	9	139	150
													10	11	141	150
													15	17	147	150
											20	22	7.5	9	145	150
													10	11	147	150
													15	17	153	175
											25	27	7.5	9	151	175
													10	11	153	175
													0	0	0	0

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

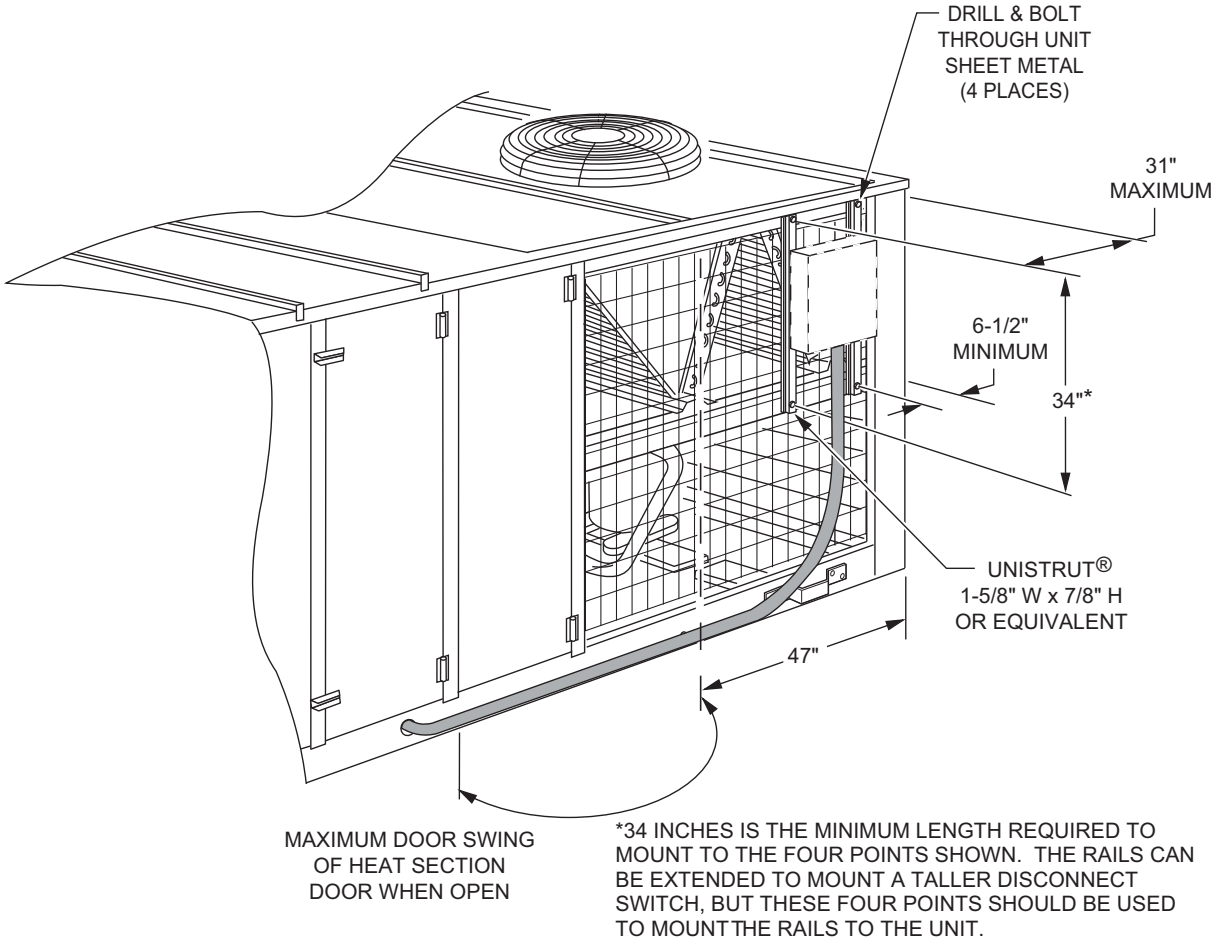

DRILL & BOLT
THROUGH UNIT
SHEET METAL
(4 PLACES)
31"
MAXIMUM
6-1/2"
MINIMUM
34"*
UNISTRUT®
1-5/8" W x 7/8" H
OR EQUIVALENT
47"
MAXIMUM DOOR SWING
OF HEAT SECTION
DOOR WHEN OPEN
*34 INCHES IS THE MINIMUM LENGTH REQUIRED TO MOUNT TO THE FOUR POINTS SHOWN. THE RAILS CAN BE EXTENDED TO MOUNT A TALLER DISCONNECT SWITCH, BUT THESE FOUR POINTS SHOULD BE USED TO MOUNT THE RAILS TO THE UNIT.

FIGURE 15 - FIELD INSTALLED DISCONNECT

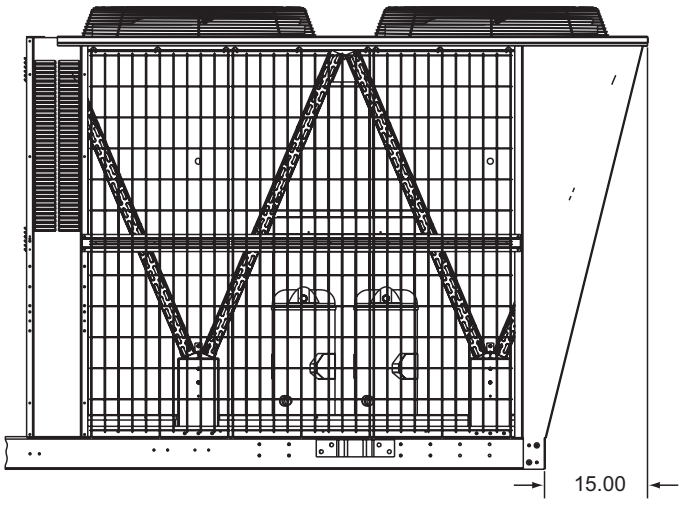


FIGURE 16 - 40 TON CONDENSER DETAIL

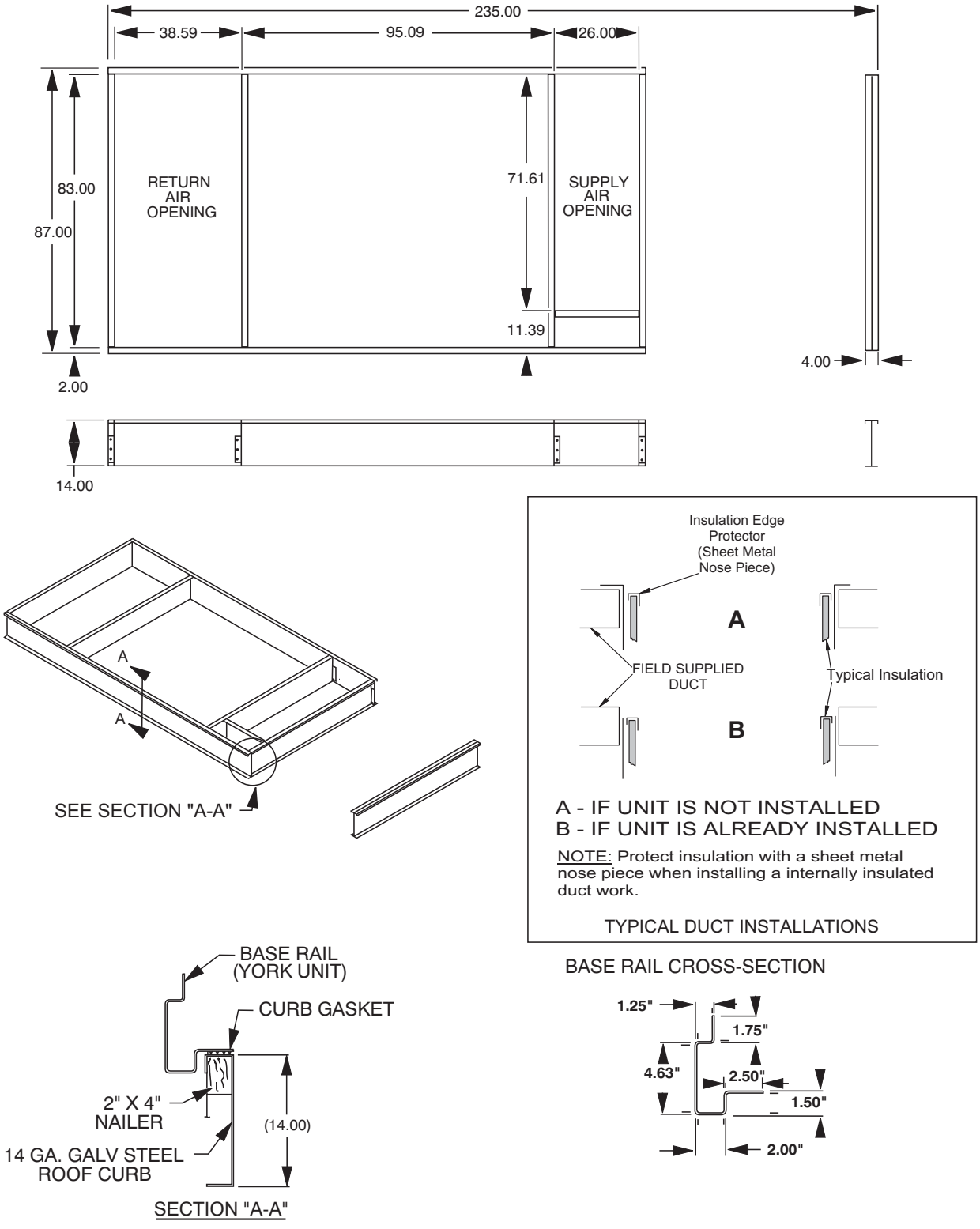


FIGURE 17 - PARTIAL ROOF CURB MODEL 1RC0455P

CFM, STATIC PRESSURE, AND POWER - ALTITUDE AND TEMPERATURE CORRECTIONS

The information below should be used to assist in application of product when being applied at altitudes at or exceeding 1000 feet above sea level.

The air flow rates listed in the standard blower performance tables are based on standard air at sea level. As the altitude or temperature increases, the density of air decreases. In order to use the indoor blower tables for high altitude applications, certain corrections are necessary.

A centrifugal fan is a "constant volume" device. This means that, if the rpm remains constant, the CFM delivered is the same regardless of the density of the air. However, since the air at high altitude is less dense, less static pressure will be generated and less power will be required than a similar application at sea level. Air density correction factors are shown in Table 29 and Figure 18.

TABLE 29: ALTITUDE CORRECTION FACTORS

AIR TEMP	ALTITUDE (FEET)										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
40	1.060	1.022	0.986	0.950	0.916	0.882	0.849	0.818	0.788	0.758	0.729
50	1.039	1.002	0.966	0.931	0.898	0.864	0.832	0.802	0.772	0.743	0.715
60	1.019	0.982	0.948	0.913	0.880	0.848	0.816	0.787	0.757	0.729	0.701
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.715	0.688
80	0.982	0.947	0.913	0.880	0.848	0.817	0.787	0.758	0.730	0.702	0.676
90	0.964	0.929	0.897	0.864	0.833	0.802	0.772	0.744	0.716	0.689	0.663
100	0.946	0.912	0.880	0.848	0.817	0.787	0.758	0.730	0.703	0.676	0.651

The examples below will assist in determining the airflow performance of the product at altitude.

Example 1: What are the corrected CFM, static pressure, and BHP at an elevation of 5,000 ft. if the blower performance data is 6,000 CFM, 1.5 IWC and 4.0 BHP?

Solution: At an elevation of 5,000 ft the indoor blower will still deliver 6,000 CFM if the rpm is unchanged. However, Table 29 must be used to determine the static pressure and BHP. Since no temperature data is given, we will assume an air temperature of 70°F. Table 29 shows the correction factor to be 0.832.

Corrected static pressure = 1.5 x 0.832 = 1.248 IWC

Corrected BHP = 4.0 x 0.832 = 3.328

Example 2: A system, located at 5,000 feet of elevation, is to deliver 6,000 CFM at a static pressure of 1.5". Use the unit blower tables to select the blower speed and the BHP requirement.

Solution: As in the example above, no temperature information is given so 70°F is assumed.

The 1.5" static pressure given is at an elevation of 5,000 ft. The first step is to convert this static pressure to equivalent sea level conditions.

Sea level static pressure = 1.5 / .832 = 1.80"

Enter the blower table at 6000 sCFM and static pressure of 1.8". The rpm listed will be the same rpm needed at 5,000 ft.

Suppose that the corresponding BHP listed in the table is 3.2. This value must be corrected for elevation.

BHP at 5,000 ft = 3.2 x .832 = 2.66

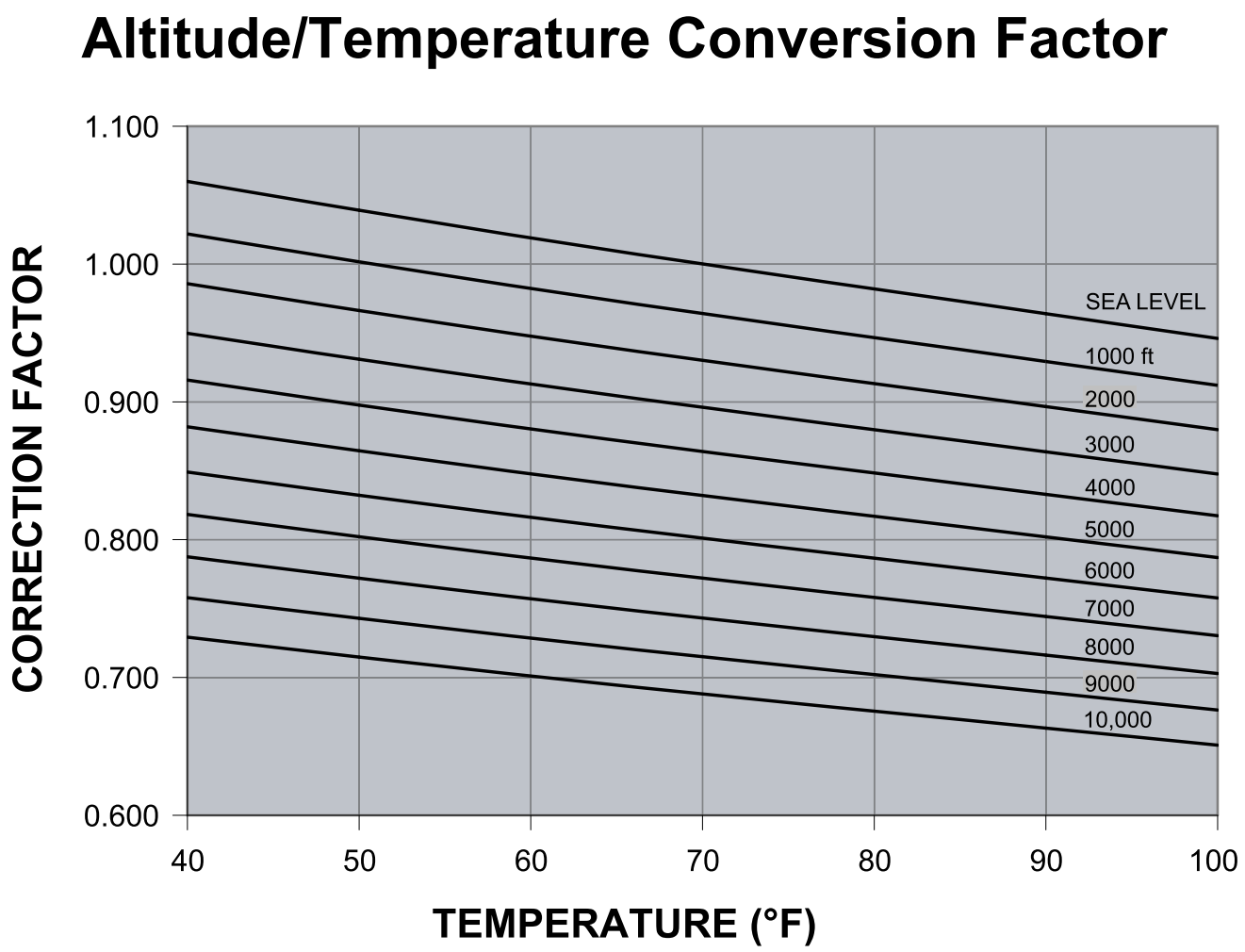


FIGURE 18 - ALTITUDE/TEMPERATURE CONVERSION FACTOR

TABLE 30: FAN PERFORMANCE - 25 TON[1, 2]

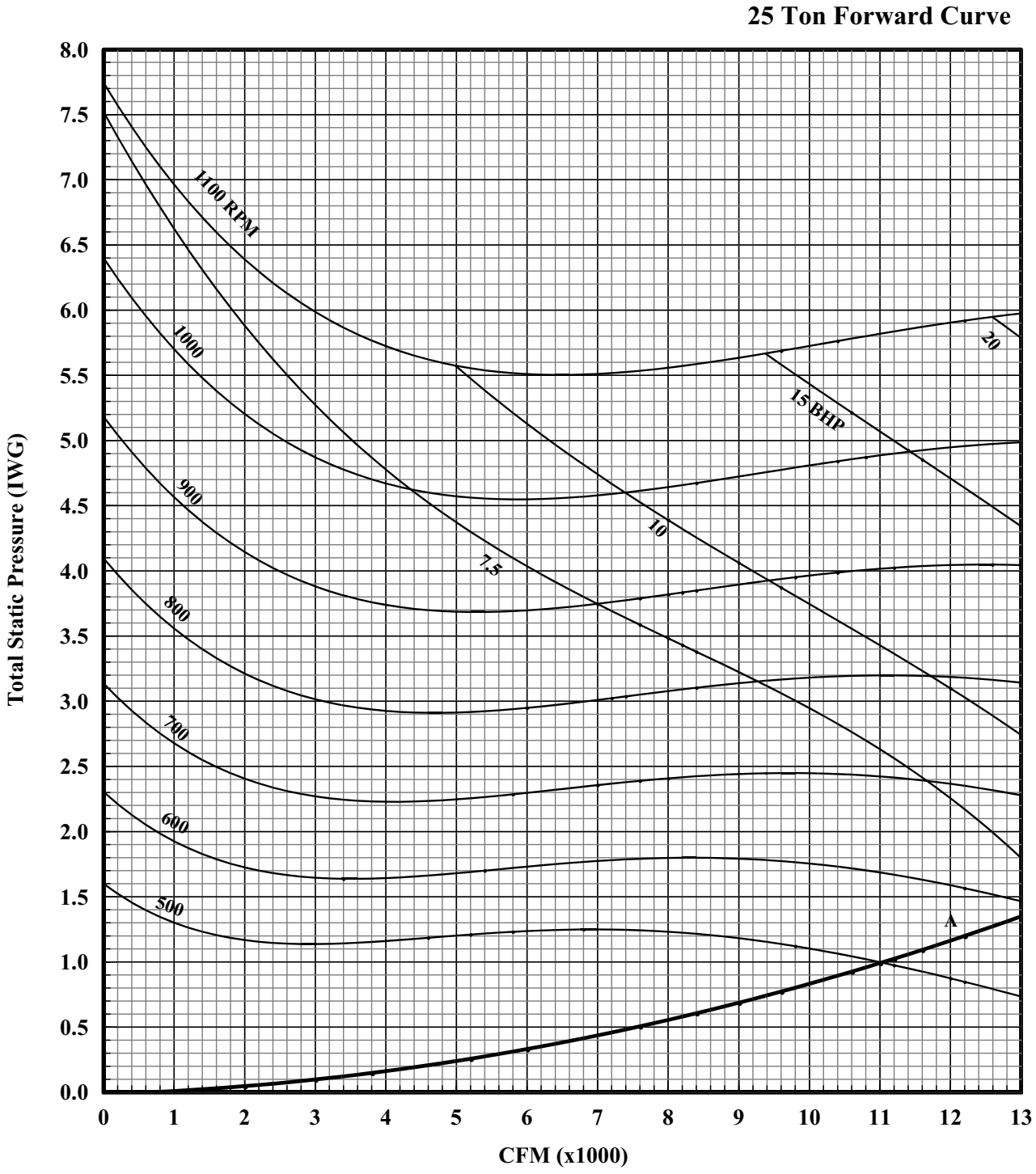
AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	302	0.5	365	0.7	422	1.0	475	1.3	523	1.5
5000	341	0.9	396	1.1	447	1.4	495	1.7	540	2.0
6000	380	1.2	427	1.5	473	1.8	516	2.1	557	2.5
7000	416	1.8	459	2.1	500	2.5	540	2.8	578	3.2
8000	452	2.3	491	2.7	528	3.1	565	3.5	600	3.9
9000	492	3.2	527	3.6	561	4.0	594	4.5	626	4.9
10000	532	4.2	563	4.5	594	4.9	624	5.4	653	5.8
11000	578	5.5	605	5.9	632	6.3	659	6.7	686	7.2
12000	623	6.8	647	7.2	671	7.6	695	8.1	719	8.6
12500	639	7.4	664	7.9	688	8.4	712	8.9	736	9.5

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	568	1.8	609	2.2	646	2.5	681	2.8	713	3.2
5000	582	2.4	621	2.7	657	3.1	692	3.5	724	3.9
6000	596	2.9	633	3.3	669	3.7	702	4.1	735	4.5
7000	615	3.6	650	4.0	683	4.5	716	4.9	747	5.4
8000	633	4.4	666	4.8	698	5.3	729	5.7	759	6.2
9000	658	5.3	688	5.8	718	6.3	747	6.8	776	7.3
10000	682	6.3	710	6.8	738	7.3	766	7.8	793	8.4
11000	713	7.7	739	8.2	765	8.8	791	9.3	816	9.9
12000	743	9.1	767	9.7	791	10.2	815	10.8	839	11.4
12500	760	10.0	784	10.6	807	11.2	830	11.7	853	12.3

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	2.2		2.4		2.6		2.8		3.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	743	3.5	770	3.9	796	4.3	821	4.6	844	5.0
5000	754	4.3	783	4.7	810	5.1	836	5.5	861	5.9
6000	766	5.0	795	5.4	824	5.9	851	6.4	878	6.8
7000	777	5.8	806	6.3	834	6.8	861	7.3	888	7.8
8000	788	6.7	817	7.2	844	7.7	871	8.2	898	8.8
9000	804	7.8	831	8.3	857	8.9	883	9.5	909	10.0
10000	819	8.9	845	9.5	870	10.1	896	10.7	920	11.3
11000	841	10.5	866	11.1	890	11.7	914	12.3	938	12.9
12000	863	12.0	887	12.6	910	13.2	933	13.9	956	14.5
12500	876	12.9	899	13.6	921	14.2	943	14.8	965	15.5

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	3.2		3.4		3.6		3.8		4.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	867	5.4	890	5.8	912	6.2	935	6.6	958	6.9
5000	885	6.4	909	6.8	932	7.2	956	7.6	979	8.0
6000	903	7.3	928	7.8	953	8.2	976	8.7	1000	9.1
7000	914	8.3	939	8.8	963	9.4	988	9.9	1012	10.5
8000	924	9.3	949	9.9	974	10.5	999	11.2	1023	11.8
9000	934	10.6	959	11.2	983	11.9	1007	12.5	1030	13.2
10000	944	11.9	968	12.6	992	13.2	1015	13.8	1037	14.5
11000	961	13.6	984	14.2	1007	14.9	1029	15.6	1051	16.2
12000	978	15.2	1000	15.9	1022	16.6	1043	17.3	1064	18.0
13000	986	16.2	1008	16.8	1029	17.5	1050	18.2	1070	19.0

1. Fan performance is based on wet evaporator coils, clean 2" throwaway filters and system/cabinet effects at standard air density and 0 feet elevation.
2. Refer to Tables 57, 15, 21 and 33 for component additions and deductions to fan performance tables.
3. BHP includes drive losses.
4. **Shaded RPMs require Class II blower.**



A - Standard Unit

Note: Standard Unit includes wet evaporator coil, clean 2" throwaway filters, system and cabinet effects at standard air density and 0' elevation.

FIGURE 19 - FAN PERFORMANCE - 25 TON

TABLE 31: FAN PERFORMANCE - 30 TON [1, 2]

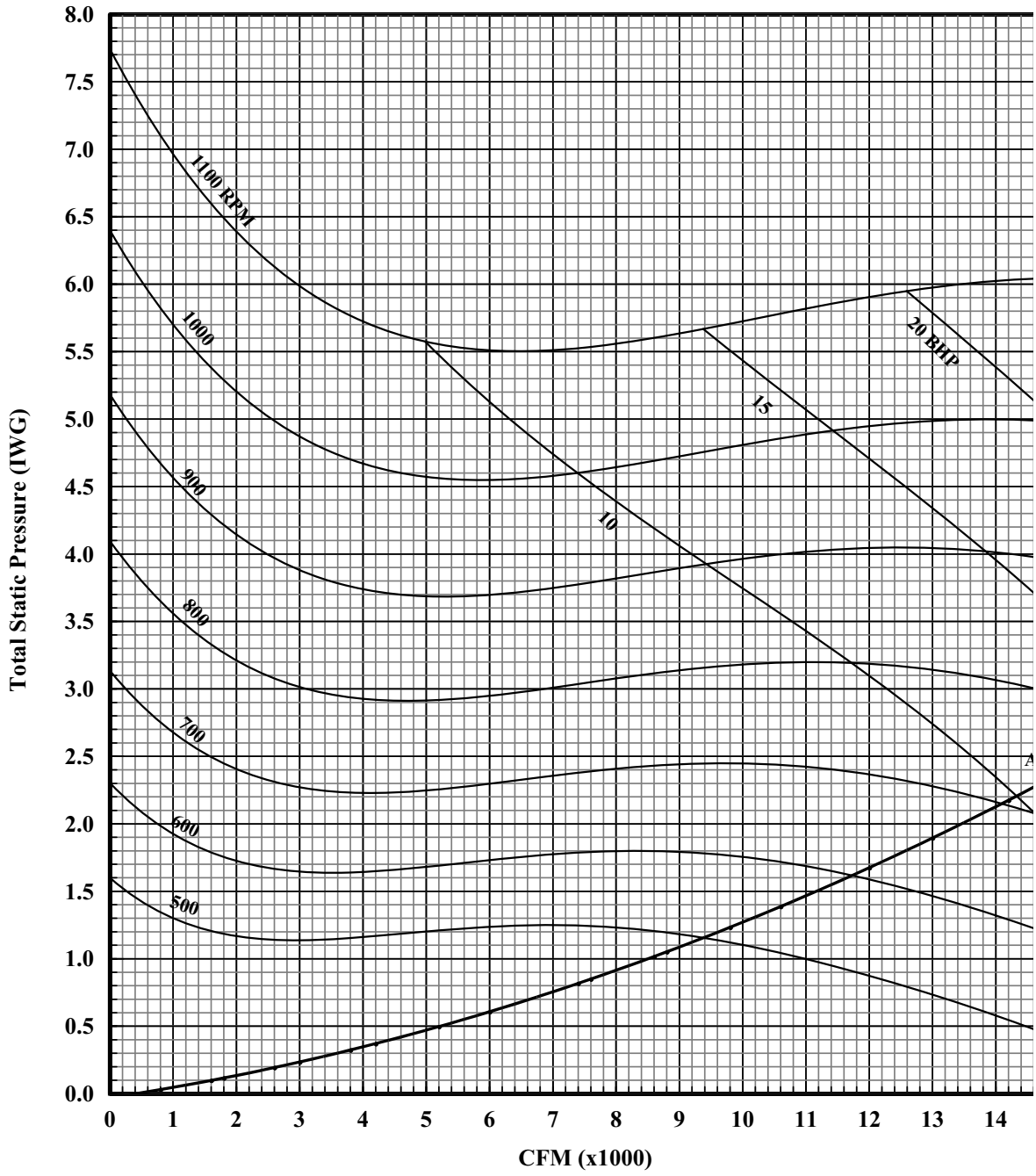
AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	405	1.3	450	1.6	494	2.0	535	2.3	575	2.7
7000	444	1.9	485	2.3	524	2.7	562	3.0	599	3.4
8000	483	2.6	519	2.9	555	3.3	589	3.7	623	4.2
9000	520	3.5	554	3.9	586	4.3	618	4.7	649	5.2
10000	558	4.5	588	4.8	618	5.2	647	5.7	676	6.2
11000	603	5.7	629	6.2	656	6.7	683	7.2	709	7.7
12000	647	7.0	671	7.5	695	8.1	718	8.6	742	9.2
13000	687	8.9	709	9.3	731	9.9	753	10.4	776	10.9
14000	728	10.7	748	11.2	768	11.6	789	12.2	809	12.7
15000	767	12.7	786	13.2	805	13.8	825	14.4	845	15.0

AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	612	3.1	649	3.5	683	3.9	717	4.3	748	4.7
7000	634	3.8	668	4.3	701	4.7	733	5.1	763	5.6
8000	655	4.6	687	5.1	719	5.5	749	6.0	779	6.5
9000	680	5.6	710	6.1	739	6.6	768	7.2	796	7.7
10000	704	6.7	732	7.2	760	7.7	787	8.3	813	8.9
11000	735	8.2	761	8.7	787	9.3	812	9.8	837	10.4
12000	766	9.7	790	10.3	814	10.8	837	11.4	861	12.0
13000	798	11.5	820	12.1	843	12.7	865	13.3	887	13.9
14000	830	13.3	851	13.9	872	14.6	893	15.2	914	15.9
15000	864	15.6	884	16.3	904	16.9	923	17.6	943	18.3

AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	2.2		2.4		2.6		2.8		3.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	779	5.1	808	5.5	837	6.0	864	6.4	890	6.9
7000	793	6.1	822	6.6	850	7.0	877	7.5	903	8.1
8000	807	7.0	836	7.6	863	8.1	890	8.6	916	9.2
9000	823	8.3	850	8.8	877	9.4	902	10.0	928	10.6
10000	839	9.5	865	10.1	890	10.7	915	11.3	940	12.0
11000	862	11.0	886	11.6	910	12.2	934	12.9	957	13.5
12000	884	12.5	907	13.2	930	13.8	953	14.4	975	15.0
13000	909	14.6	931	15.2	953	15.9	975	16.5	996	17.2
14000	935	16.6	956	17.3	976	18.0	997	18.7	1017	19.4
15000	963	18.9	982	19.6	1002	20.4	1021	21.1	1040	21.8

AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	3.2		3.4		3.6		3.8		4.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	916	7.4	940	7.9	964	8.3	988	8.8	1011	9.3
7000	928	8.6	953	9.1	977	9.6	1000	10.1	1023	10.7
8000	941	9.8	965	10.3	989	10.9	1013	11.5	1035	12.0
9000	952	11.2	976	11.8	1000	12.4	1023	13.0	1045	13.6
10000	964	12.6	987	13.2	1010	13.9	1033	14.5	1055	15.1
11000	981	14.1	1003	14.8	1025	15.5	1047	16.1	1069	16.8
12000	997	15.7	1019	16.4	1040	17.1	1061	17.8	1082	18.5
13000	1017	17.9	1038	18.6	1058	19.4	1078	20.1	1097	20.8
14000	1037	20.2	1056	20.9	1076	21.6	1094	22.4	1113	23.1
15000	1059	22.6	1078	23.3	1097	24.1	1115	24.9	1134	25.7

1. Fan performance is based on wet evaporator coils, clean 2" throwaway filters and system/cabinet effects at standard air density and 0 feet elevation.
2. Refer to Tables 57, 15, 21 and 33 for component additions and deductions to fan performance tables.
3. BHP includes drive losses.
4. **Shaded RPMs require Class II blower.**



A - Standard Unit

Note: Standard Unit includes wet evaporator coil, clean 2" throwaway filters, system and cabinet effects at standard air density and 0' elevation.

FIGURE 23 - FAN PERFORMANCE - 30 TON

FIGURE 20 - FAN PERFORMANCE - 30 TON

TABLE 32: FAN PERFORMANCE - 40 TON[1,2]

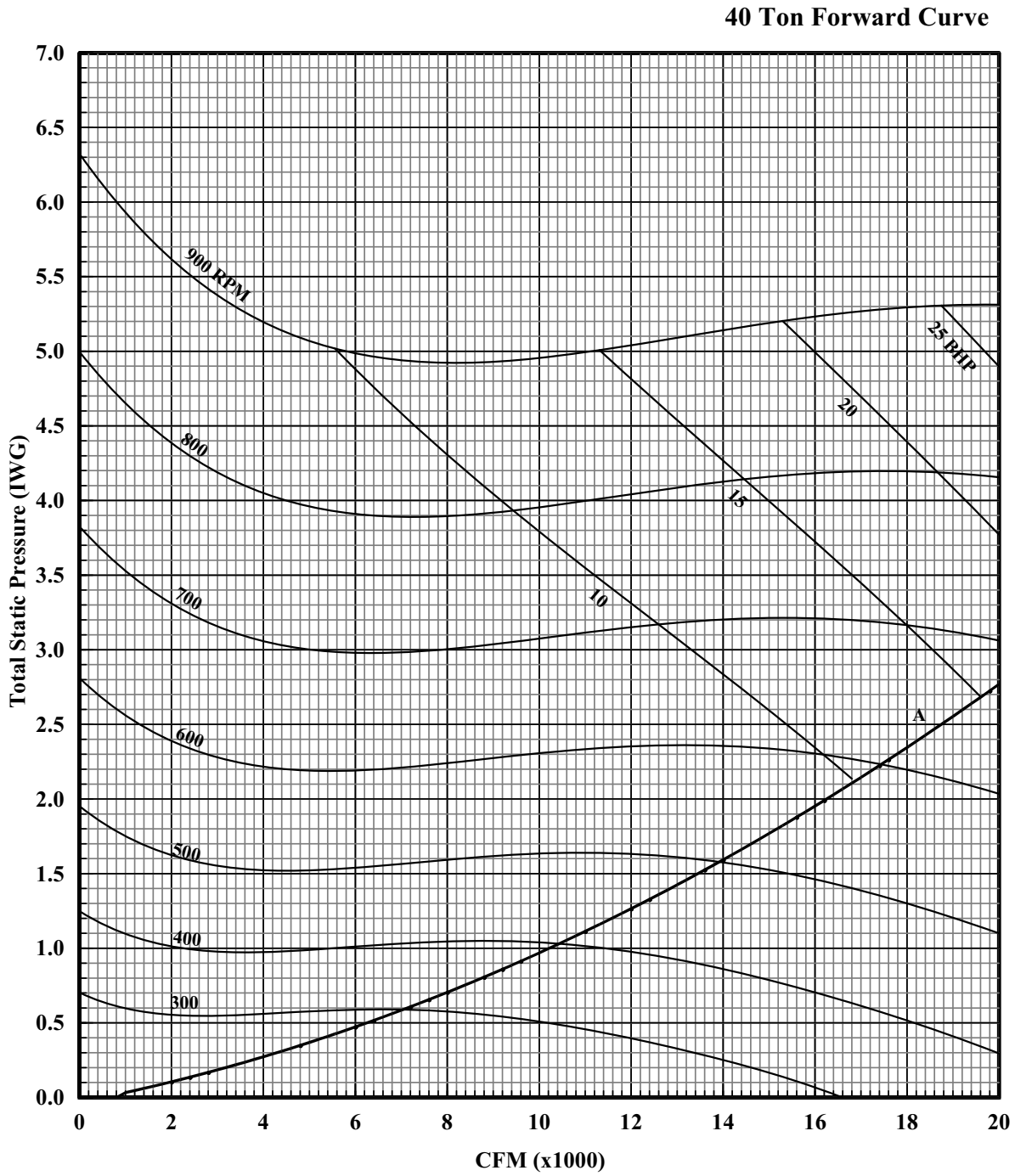
AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	367	1.9	409	2.3	448	2.8	485	3.3	519	3.8
9000	396	2.5	433	3.0	469	3.5	504	4.0	536	4.5
10000	424	3.1	458	3.6	491	4.1	523	4.6	553	5.2
11000	454	4.0	486	4.5	516	5.1	546	5.6	574	6.2
12000	484	5.0	513	5.5	542	6.1	569	6.6	596	7.2
13000	507	5.9	535	6.5	562	7.1	589	7.8	614	8.4
14000	530	6.9	557	7.6	583	8.2	608	8.9	633	9.6
15000	560	8.4	584	9.1	609	9.7	632	10.4	655	11.2
16000	589	9.8	612	10.5	634	11.3	656	12.0	678	12.7
17000	613	11.7	635	12.4	657	13.1	678	13.8	699	14.6
18000	638	13.6	659	14.3	680	15.0	700	15.7	721	16.5

AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	552	4.2	583	4.7	612	5.2	639	5.7	665	6.2
9000	567	5.0	596	5.5	624	6.0	651	6.6	677	7.1
10000	582	5.7	610	6.3	637	6.9	663	7.4	688	8.0
11000	602	6.8	628	7.4	654	8.0	679	8.6	703	9.2
12000	621	7.9	647	8.5	671	9.1	695	9.8	718	10.4
13000	639	9.1	664	9.7	687	10.4	710	11.1	733	11.8
14000	657	10.3	681	11.0	704	11.7	726	12.5	748	13.2
15000	678	11.9	700	12.6	722	13.3	744	14.1	765	14.9
16000	699	13.5	720	14.2	741	15.0	761	15.8	781	16.5
17000	720	15.4	740	16.1	760	16.9	780	17.8	799	18.6
18000	740	17.3	760	18.1	780	18.9	799	19.7	818	20.6

AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	2.2		2.4		2.6		2.8		3.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	690	6.7	713	7.2	736	7.7	758	8.2	779	8.8
9000	701	7.7	725	8.2	747	8.8	769	9.4	790	10.0
10000	712	8.7	736	9.3	759	9.9	781	10.6	802	11.2
11000	726	9.9	749	10.5	771	11.2	793	11.9	814	12.6
12000	740	11.1	762	11.8	784	12.5	805	13.2	826	13.9
13000	755	12.5	776	13.3	797	14.0	818	14.7	838	15.5
14000	769	14.0	790	14.7	811	15.5	831	16.3	851	17.1
15000	785	15.6	805	16.4	825	17.2	845	18.0	864	18.9
16000	801	17.3	820	18.1	839	19.0	858	19.8	877	20.6
17000	819	19.4	837	20.3	856	21.1	874	22.0	892	22.9
18000	836	21.5	855	22.4	873	23.3	890	24.2	908	25.1

AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	3.2		3.4		3.6		3.8		4.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	799	9.3	819	9.9	839	10.6	859	11.2	879	11.9
9000	811	10.6	831	11.3	851	11.9	871	12.6	891	13.3
10000	823	11.9	843	12.6	863	13.3	883	13.9	902	14.6
11000	834	13.3	855	14.0	874	14.7	894	15.4	913	16.1
12000	846	14.6	866	15.4	885	16.1	905	16.8	924	17.5
13000	858	16.3	877	17.0	896	17.8	915	18.6	934	19.3
14000	870	17.9	889	18.7	908	19.5	926	20.3	944	21.1
15000	882	19.7	901	20.5	919	21.4	937	22.2	955	23.1
16000	895	21.5	913	22.4	931	23.3	948	24.2	966	25.1
17000	910	23.8	928	24.7	945	25.6	962	-	-	-
18000	925	26.0	-	-	-	-	-	-	-	-

1. Fan performance is based on wet evaporator coils, clean 2" throwaway filters and system/cabinet effects at standard air density and 0 feet elevation.
2. Refer to Tables 58, 18, 49 and 33 for component additions and deductions to fan performance tables.
3. BHP includes drive losses.
4. **Shaded RPMs require Class II blower.**



A - Standard Unit

Note: Standard Unit includes wet evaporator coil, clean 2" throwaway filters, system and cabinet effects at standard air density and 0' elevation.

FIGURE 21 - FAN PERFORMANCE - 40 TON

TABLE 33: COMPONENT STATIC RESISTANCE[1, 2]

COMPONENT COIL LOSSES	CFM							
	4,000	6,000	8,000	10,000	12,000	14,000	16,000	18,000
COIL LOSSES 25T								
3 Row, 16 FPI, dry	-0.14	-0.18	-0.24	-0.34	-0.45	-	-	-
3 Row, 16 FPI, wet	Baseline	Baseline	Baseline	Baseline	Baseline	-	-	-
COIL LOSSES 30T								
4 Row, 16 FPI, dry	-0.18	-0.22	-0.32	-0.45	-0.60	-0.76	-	-
4 Row, 16 FPI, wet	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	-	-
COIL LOSSES 40T								
4 Row, 16 FPI, dry	-0.15	-0.22	-0.26	-0.31	-0.42	-0.53	-.0.65	-0.79
4 Row, 16 FPI, wet	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
FILTER LOSSES								
2” TA or HI EFF.	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Rigid 6”, 65%	0.06	0.12	0.19	0.27	0.36	0.46	0.58	0.70
Rigid 6”, 95%	0.13	0.26	0.41	0.60	0.81	1.04	1.29	1.57
IGV LOSSES								
25 & 30 Ton F.C.	0.02	0.05	0.08	0.13	0.19	0.26	0.34	0.43
40 Ton F.C.	0.01	0.03	0.05	0.08	0.11	0.15	0.19	0.25
GAS HEAT								
267 MBH Heat	0.07	0.11	0.14	0.18	0.21	0.25	0.28	0.32
533 MBH Heat	0.14	0.21	0.28	0.35	0.42	0.49	0.57	0.64
800 MBH Heat	0.21	0.32	0.42	0.53	0.64	0.74	0.85	0.95
ELECTRIC HEAT								
40KW	0.01	0.02	0.04	0.06	0.10	0.20	0.31	0.40
80KW	0.01	0.04	0.08	0.13	0.20	0.31	0.44	0.56
108KW	0.02	0.05	0.10	0.15	0.31	0.43	0.53	0.68
ECONOMIZER	0.03	0.06	0.10	0.15	0.21	0.28	0.35	0.43
POWER EXHAUST	0.02	0.05	0.08	0.13	0.18	0.25	0.32	0.41

1. Baseline losses based on system/cabinet effects, wet standard coil and 2” throwaway filters at 70°F, 0 feet elevation with standard air.
2. See Tables 57, 58, 15, 18 and 21 for hot water and steam water coil static resistance.

TABLE 34: SUPPLY FAN MOTOR AND DRIVE DATA

Model	Blower RPM Range	Motor				Motor Pulley		Blower Pulley		Belts	
		HP	Frame Size	Motor Efficiency (Std. Motor)	Motor Efficiency (Ultra Hi Eff Opt)	Pitch Dia (Inches)	Bore (Inches)	Pitch Dia (Inches)	Bore (Inches)	Designation	Qty
25 Ton	567	7.5	213T	88.5	91.7	4.5	1-3/8	13.9	2-3/16	BX56	2
	692	10	215T	89.5	91	5.5	1-3/8	13.9	2-3/16	BX56	2
	793	15	254T	91	91.7	6.3	1-5/8	13.9	2-3/16	BX56	2
	894	20	256T	91	93	7.1	1-5/8	13.9	2-3/16	BX56	2
30 Ton	617	10	215T	89.5	91	4.9	1-3/8	13.9	2-3/16	BX56	2
	743	15	254T	91	91.7	5.9	1-5/8	13.9	2-3/16	BX56	2
	856	20	256T	91	93	6.7	1-5/8	13.7	2-3/16	5VX610	2
	907	25	284T	91.7	93.6	7.1	1-7/8	13.7	2-3/16	5VX610	2
40 Ton	617	10	215T	89.5	91	4.9	1-3/8	13.9	2-7/16	BX67	2
	652	15	254T	91	91.7	5.1	1-5/8	13.7	2-7/16	5VX710	2
	728	20	256T	91	93	5.7	1-5/8	13.7	2-7/16	5VX710	2
	780	25	284T	91.7	93.6	6.1	1-7/8	13.7	2-7/16	5VX710	2

TABLE 35: EXHAUST FAN DRIVE DATA

Model	Blower RPM Range	Motor				Motor Pulley		Blower Pulley		Belts	
		HP	Frame Size	Motor Eff (Std. Motor)	Motor Eff (Hi Eff opt)	Pitch Dia (Inches)	Bore (Inches)	Pitch Dia (Inches)	Bore (Inches)	Designation	Qty
25 Ton	758	5	213T	87.5	89.5	4.9	1-3/8	11.3	2-3/16	BX63	2
	852	7.5	215T	88.5	91.7	5.5	1-3/8	11.3	2-3/16	BX63	2
	976	10	215T	89.5	91	6.3	1-5/8	11.3	2-3/16	BX63	2
30 Ton	852	7.5	213T	84	86.5	5.5	1-3/8	11.3	1-11/16	B65	2
	976	10	215T	86.5	89.5	6.3	1-3/8	11.3	1-11/16	B65	2
	1069	15	254T	85.7	89.5	6.9	1-3/8	11.3	1-11/16	B65	2
40 Ton	852	7.5	184T	84	86.5	5.5	1-3/8	11.3	1-11/16	B65	2
	976	10	215T	86.5	89.5	6.3	1-3/8	11.3	1-11/16	B65	2
	1069	15	254T	85.7	89.5	6.9	1-3/8	11.3	1-11/16	B65	2

TABLE 36: POWER EXHAUST - ONE FORWARD CURVED FAN 25 TON[1]

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]
2000	---	---	---	---	524	0.3	609	0.4	685	0.6
3000	---	---	450	0.4	531	0.5	605	0.7	672	0.8
4000	442	0.7	496	0.8	562	0.9	626	1.1	687	1.2
5000	524	1.2	566	1.4	609	1.5	663	1.7	717	1.8
6000	612	1.9	646	2.2	679	2.4	717	2.6	762	2.7
7000	703	3.0	731	3.3	759	3.5	787	3.7	820	4.0
8000	791	3.8	821	4.3	844	4.8	868	5.2	892	5.5
9000	877	5.8	911	6.2	932	6.5	953	6.9	974	7.3
10000	967	8.4	1004	8.8	1022	9.1	1041	9.4	1059	9.8

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]
2000	754	0.7	819	0.8	878	0.9	933	1.1	986	1.2
3000	736	1.0	797	1.1	854	1.3	909	1.5	961	1.7
4000	743	1.4	799	1.5	850	1.7	900	1.9	948	2.1
5000	768	2.0	818	2.2	865	2.4	911	2.6	955	2.8
6000	806	2.9	850	3.1	895	3.3	937	3.6	978	3.8
7000	857	4.2	895	4.4	933	4.6	972	4.8	1010	5.0
8000	921	5.7	953	6.0	985	6.2	1018	6.5	1052	6.8
9000	995	7.6	1020	8.0	1048	8.3	1075	8.5	1103	8.8
10000	1077	10.1	1096	10.4	1119	10.8	1143	11.1	1167	11.4

1. Fan performance is based on system/cabinet effects and back draft damper effects at standard air density and 0 feet of elevation.
2. BHP includes 5% drive losses.

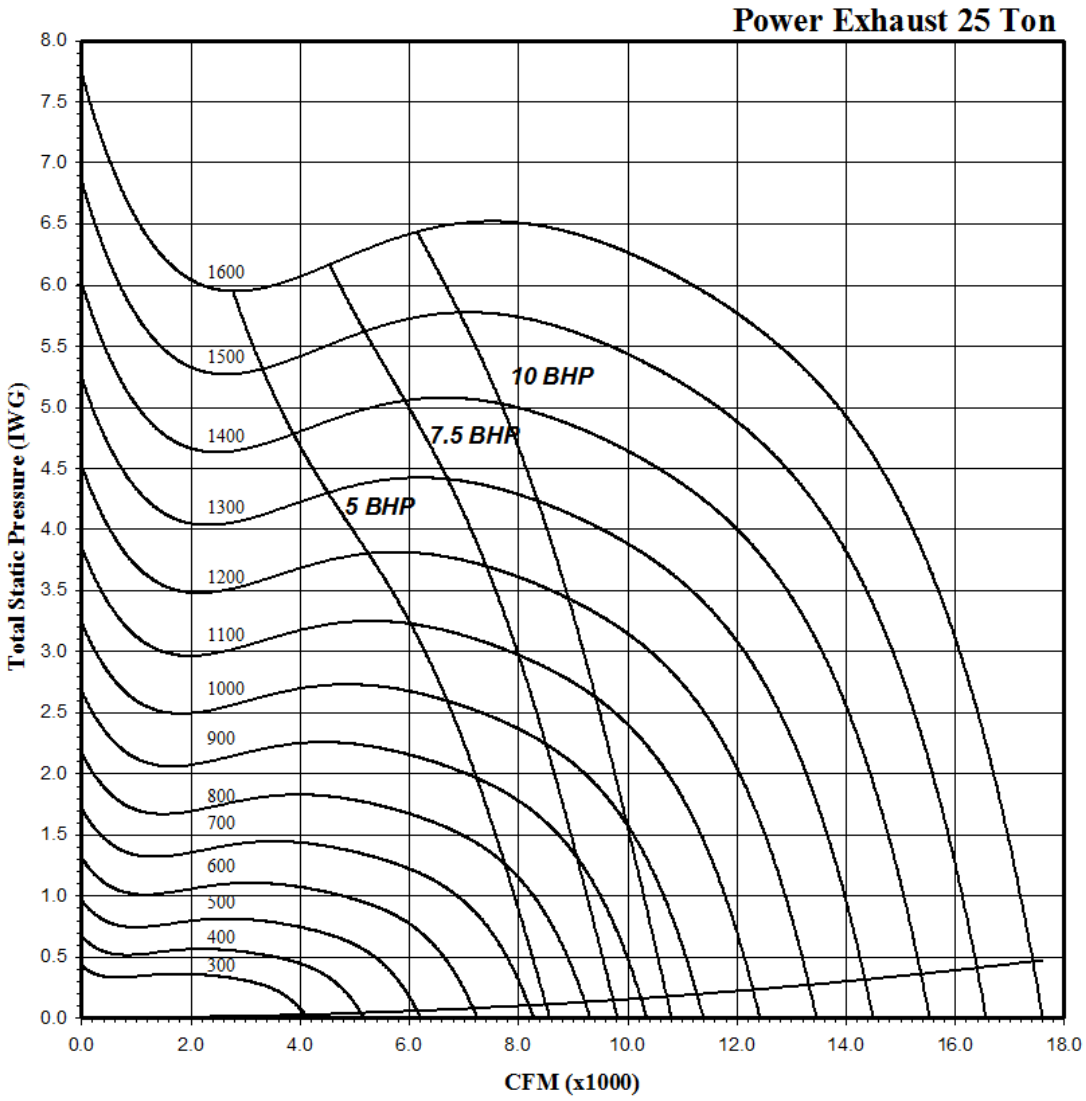


FIGURE 22 - POWER EXHAUST - ONE FORWARD CURVE FAN - 25 TONS

TABLE 37: POWER EXHAUST - TWO FORWARD CURVED FANS - 30 & 40 TON[1]

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	0.2		0.4		.06		0.8		1.0	
	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]
4000	363	0.32	468	0.53	560	0.74	641	0.95	716	1.16
5000	402	0.53	494	0.74	576	1.05	652	1.26	722	1.47
6000	445	0.84	527	1.05	602	1.37	670	1.68	735	2.00
7000	494	1.26	565	1.58	633	1.79	697	2.10	757	2.52
8000	544	1.79	609	2.10	670	2.42	729	2.73	784	3.15
9000	597	2.42	654	2.84	711	3.15	765	3.47	817	3.89
10000	651	3.26	703	3.68	754	3.99	805	4.41	853	4.83
11000	705	4.31	753	4.73	801	5.15	847	5.57	893	5.99
12000	761	5.46	805	5.88	849	6.30	893	6.83	934	7.25
13000	817	6.93	858	7.35	899	7.77	939	8.30	979	8.82
14000	874	8.51	912	9.03	950	9.56	988	9.98	1025	10.50
15000	932	10.40	967	10.92	1002	11.55	1037	12.08	1072	12.60
16000	989	12.60	1022	13.23	1055	13.76	1088	14.28	-	-

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	1.2		1.4		1.6		1.8		2	
	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]
4000	783	1.47	844	1.68	903	1.89	956	2.21	1008	2.42
5000	788	1.79	848	2.10	906	2.42	959	2.63	1011	2.94
6000	798	2.21	855	2.63	911	2.94	963	3.26	1014	3.57
7000	814	2.84	869	3.15	922	3.47	972	3.89	1021	4.20
8000	837	3.47	889	3.89	938	4.20	987	4.62	1033	5.04
9000	866	4.31	915	4.73	961	5.15	1007	5.57	1050	5.99
10000	900	5.25	945	5.67	989	6.20	1032	6.62	1073	7.14
11000	936	6.41	979	6.93	1020	7.35	1061	7.88	1101	8.30
12000	976	7.77	1016	8.30	1055	8.72	1094	9.24	1131	9.77
13000	1018	9.35	1055	9.87	1093	10.40	1129	10.92	1165	11.55
14000	1061	11.13	1098	11.66	1133	12.29	1167	12.92	1202	13.44
15000	1107	13.23	1141	13.76	1175	14.39	1208	14.91	1240	15.54

1. Fan performance is based on system/cabinet effects and back draft damper effects at standard air density and 0 feet elevation.
2. BHP includes the sum of both exhaust fan motors.
3. BHP includes 5% drive losses.

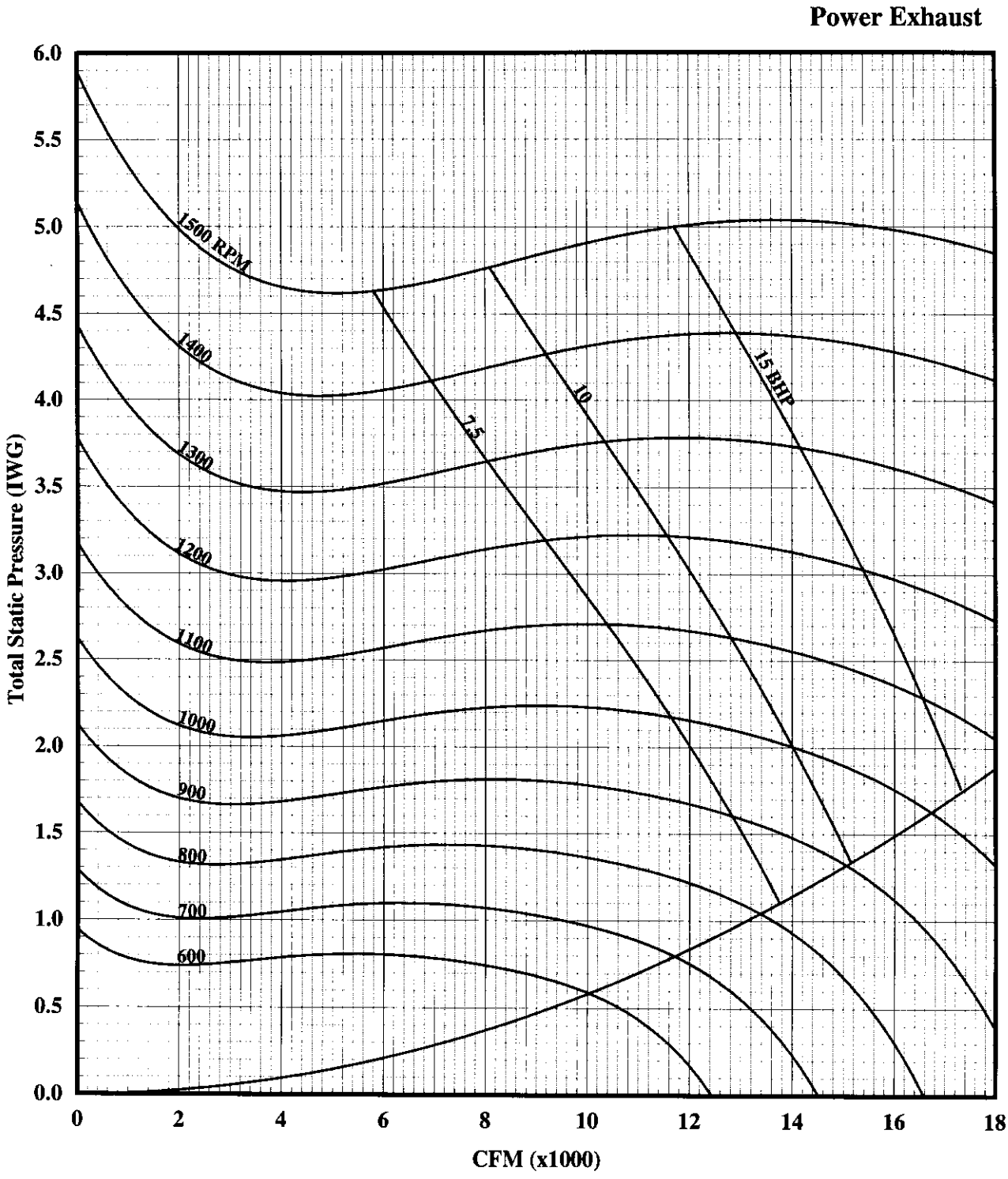


FIGURE 23 - POWER EXHAUST - TWO FORWARD CURVED FANS - 30 & 40 TONS

START-UP

COMPRESSOR ROTATION

Check for proper compressor rotation (See page 66 for symptoms of reverse compressor operations). Series 40 units are properly phased at the factory. If the blower, condenser fan, or compressor, rotate in the wrong direction at start-up, the electrical connection to the unit is misphased. Change the incoming line connection phasing to obtain proper rotation.

⚠ CAUTION

Scroll compressors require proper rotation to operate correctly. Units are properly phased at the factory. DO NOT change the internal wiring to make the blower, condenser fans or compressor rotate correctly.

SUPPLY AIR FAN INSTRUCTIONS

CHECK BLOWER BEARING SET SCREWS

- The bearing set screws on the supply air blower are properly torqued before shipment. However, in transit they may loosen. Prior to start up they should be rechecked. The set screws are 3/8" and the torque range is 200 - 215 in.-lbs.

NOTE: If a unit is equipped with exhaust fans, those bearing set screws should also be rechecked. The set screws are 1/4 inch and the torque range is 70 - 87 in.-lbs.

CHECKING SUPPLY AIR CFM

The RPM of the supply air blower will depend on the required CFM, the static pressure resistances of the unit components (Tables 33, 48, 49, 57, and 58) and the static pressure resistances of both the supply and the return air duct systems. With this information, the RPM for the supply air blower can be determined from the blower performance data in Tables 30, 31, and 32. See Table 34 for pulley and drive information for the fixed pitch pulleys supplied on the unit.

The supply air CFM must be within the limitations shown in Table 2, and Class II fans must be specified where conditions exceed the rpm limitations of Class I.

NOTE: If unit is equipped with power exhaust fans or return air fan see Tables 36 and 37 for fan performance and for pulley and drive information see Table 35.

FAN ROTATION

Check for proper supply air blower rotation. If fans are rotating backwards the line voltage to unit point of power connection is misphased (see Compressor Rotation above.) If the condenser fans are rotating in the correct direction and the supply fan is not, it will be necessary to switch leads on the output side of the VFD, since changing phase on the input side of a VFD does not change rotation on the output side. If the VFD is equipped with a bypass, verify that rotation is correct in the bypass mode.

NOTE: If unit is equipped with power exhaust fans or return air fan also check them for proper rotation.

VFD units with bypass must not have the bypass activated unless all individual space dampers are full open. It is the responsibility of the installer to interconnect the bypass mode to the signal to open all boxes on the circuit.

BELT TENSION

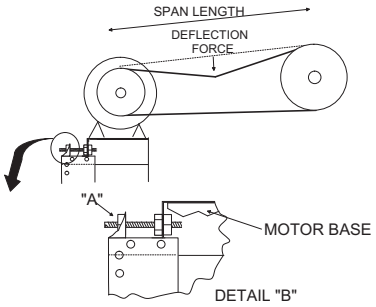
The tension on the belt should be adjusted as shown in Figure 24 and Table 38.

NOTE: If unit is equipped with power exhaust fans or return air fan check belt tension and adjust as necessary.

CAUTION

PROCEDURE FOR ADJUSTING BELT TENSION

1. Loosen four bolts holding motor base to channels
2. Adjust belt by turning nuts "A" (see detail "B").
3. Using a belt tension checker, apply a perpendicular force to one belt at the midpoint of the span as shown. The deflection force should be applied until a specific deflection distance of 1/64" per inch of span length is obtained.
4. To determine the deflection distance from normal position, use a straight edge from sheave to sheave as a reference line. Use the recommended deflection force per Belt Adjustment Table.



Tension new belts at the maximum deflection force recommended. Check the belt tension at least two times during the first 24 hrs. of operation. Any re-tensioning should fall between the min. and max. deflection force values.

5. After adjusting, retighten bolts holding motor base to channel.

FIGURE 24 - BELT TENSION ADJUSTMENT

AIR BALANCE

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

CHECKING AIR QUANTITY

⚠ CAUTION

On VAV and VFD units be certain all IGV's on VAV unit are full open, VFD drive is set to maximum output, exhaust dampers are closed and individual space damper boxes are full open.

VFD units with bypass must not have the bypass activated unless all individual space dampers are full open.

TABLE 38: BELT ADJUSTMENT

FAN MOTOR HORSE POWER	5	7.5	10	15	20	25
30 TON FORWARD CURVED SUPPLY FAN	SIZE: 22 X 20					
Belt Deflection Force (lbs) new belts	-	-	10.5	12.6	15.2	22.1
Belt Deflection Force (lbs) old belts	-	-	7.1	8.5	10.2	14.8
40 TON FORWARD CURVED SUPPLY FAN	SIZE: 25 X 20					
Belt Deflection Force (lbs) new belts	-	-	10.5	12.6	15.2	15.2
Belt Deflection Force (lbs) old belts	-	-	7.1	8.5	10.2	10.2
30 & 40 TON POWER EXHAUST FAN	SIZE: (2) 15 X 15					
Belt Deflection Force (lbs) new belts	-	7.9	9.4	9.4	-	-
Belt Deflection Force (lbs) old belts	-	5.3	6.3	6.3	-	-
25 TON FORWARD CURVE SUPPLY FAN	SIZE: 22 X 20					
New Belt	-	10.5	10.5	12.6	15.2	-
Old Belt	-	7.1	7.1	8.5	10.2	-
25 TON POWER EXHAUST						
New Belt	10.5	10.5	12.6	-	-	-
Old Belt	7.1	7.1	8.5	-	-	-

1. Remove the dot plugs from the two 5/16 inch holes in the blower motor and the filter access doors.
2. Insert at least 8 inch of 1/4 inch metal tubing into each of these holes for sufficient penetration into the air flow on both sides of the indoor coil.
3. Using an inclined manometer or other high resolution pressure measurement device, determine the pressure drop across a dry evaporator coil. Since the moisture on an evaporator coil may vary greatly, measuring the pressure drop across a wet coil under field conditions would be inaccurate. To assure a dry coil, the compressors should be de-activated while the test is being run.
4. Knowing the pressure drop across a dry coil, the actual CFM through the unit with clean 2 inch filters, can be determined from the curve in Figure 52 and 53.

NOTE: De-energize the compressors before taking any test measurements to assure a dry evaporator coil.

⚠ WARNING

Failure to properly adjust the total system air quantity can result in extensive blower or duct damage.

After readings have been obtained, remove the tubes and reinstall the two 5/16 inch dot plugs.

It is especially important to limit the rpm of the fan in VFD-bypass-equipped units; it may be tempting to set max rpm in the VFD to less than 60 Hz - but the bypass will go to 60 Hz immediately on activation.

SUPPLY AIR DRIVE ADJUSTMENT

> **⚠ CAUTION**
>
> Before making any blower speed changes review the installation for any installation errors, leaks or undesirable systems effects that can result in loss of air flow.
>
> Even small changes in blower speed can result in substantial changes in static pressure and BHP. BHP or AMP draw of the blower motor will increase (see table 39) by the cube ratio of the blower speed. Static pressure will increase by the square ratio of the blower speed. Tables 40, 41 and 42 are for reference only. All blower speed changes must be made by qualified personnel with strict adherence to the fan laws.

At unit start-up the measured CFM based on Figures 52 and 53 may be higher or lower than the specified CFM. To achieve the specified CFM, the speed of the drive may have to be decreased or increased by changing the pitch diameter (PD) of the motor sheave as outlined below:

- (Specified CFM/Measured CFM) X PD of standard sheave = PD of new sheave.

Use the following tables and the PD calculated per the above equation to select a new motor sheave.

EXAMPLE

- A 30 ton unit was selected to deliver 12,000 CFM with a 20 HP motor and a 856 RPM drive, but the unit is only delivering 11,000 CFM per Figure 20.
- Use the equation to determine the required PD for the new motor sheave (12,000 CFM/11,000 CFM X 6.7" = 7.3091 inch).
- Use the 30 ton table to select a Browning 2B5V74 which will increase the speed of the unit's drive and its supply air CFM to 111.9%. Thus select the 7.5" PD at 112% increase over standard.
- New drive speed = 1.1194 X 856 = 958.2 RPM
- New supply air = 1.1194 X 11,000 = 12,313 CFM
- Re-use the existing belts and blower sheave.

New motor BHP = (speed increase)3 x estimated motor BHP at original start-up with 11,000 CFM and 856 RPM = (1.119)3 x 11 BHP = 1.4012 x 11 BHP = 15.41 BHP New motor amps = (speed increase)3 x measured motor amps at original start-up with 11,000 CFM and 856 RPM.

TABLE 39: BLOWER SPEED RATE OF CHANGE

CHANGE IN RPM	CHANGE IN		
	CFM	TSP	BHP AND MOTOR AMPS
.90	.90	.81	.73
.93	.93	.86	.79
.95	.95	.90	.86
.98	.98	.95	.93
1.00	1.00	1.00	1.00
1.03	1.03	1.05	1.08
1.05	1.05	1.10	1.16
1.08	1.08	1.16	1.24
1.10	1.10	1.21	1.33
1.13	1.13	1.27	1.42
1.15	1.15	1.32	1.52
1.18	1.18	1.38	1.62
1.20	1.20	1.44	1.73

SYSTEM SETPOINTS

Constant Volume and Variable Air Volume:

Thermostat and space sensor offsets must be made external to the unit. For internal settings, refer to the Settable Parameters in the Unit Control document. All parameters affecting the unit with that specific set of options and for that specific application must be reviewed. In many cases, the default settings will be fine - but verify and fine tune where necessary.

TABLE 40: 25 TON DRIVE ADJUSTMENT

7.5 HP Motor & 567 RPM Drive			10 HP Motor & 692 RPM Drive			15 HP Motor & 793 RPM Drive			20 HP Motor & 894 RPM Drive		
%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _
-	-	-	82	4.5	42	84	5.3	50	86	6.1	58
-	-	-	86	4.7	44	87	5.5	52	89	6.3	60
100	(Std.)4.5	42	89	4.9	46	90	5.7	54	91	6.5	62
104	4.7	44	93	5.1	48	94	5.9	56	94	6.7	64
109	4.9	46	96	5.3	50	97	6.1	58	97	6.9	66
113	5.1	48	100	(Std.) 5.5	52	100	(Std) 6.3	60	100	(Std.) 7.1	68
118	5.3	50	104	5.7	54	103	6.5	62	103	7.3	70
122	5.5	52	107	5.9	56	106	6.7	64	108	7.7	74
126	5.7	54	111	6.1	58	110	6.9	66	117	8.3	80
-	-	-	115	6.3	60	113	7.1	68	125	8.9	86
-	-	-	118	6.5	62	116	7.3	70	-	-	-
-	-	-	122	6.7	64	122	7.7	74	-	-	-

TABLE 41: 30 TON DRIVE ADJUSTMENT

10 HP Motor & 617 RPM Drive			15 HP Motor & 743 RPM Drive			20 HP Motor & 856 RPM Drive			25 HP Motor & 907 RPM Drive		
%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _
91.8	4.5	42	86.4	5.1	48	82.1	5.5	54	86.3	6.1	60
95.9	4.7	44	89.8	5.3	50	85.1	5.7	56	89.0	6.3	62
100.0	(Std.) 4.9	46	93.2	5.5	52	88.1	5.9	58	91.8	6.5	64
104.1	5.1	48	96.6	5.7	54	91.0	6.1	60	94.5	6.7	66
108.2	5.3	50	100.0	(Std.) 5.9	56	94.0	6.3	62	97.3	6.9	68
112.2	5.5	52	103.4	6.1	58	97.0	6.5	64	100.0	(Std.) 7.1	70
116.3	5.7	54	106.8	6.3	60	100.0	(Std.) 6.7	66	105.5	7.5	74
120.4	5.9	56	110.2	6.5	62	103.0	6.9	68	113.7	8.1	80
124.5	6.1	58	113.6	6.7	64	106.0	7.1	70	121.9	8.7	86
-	-	-	116.9	6.9	66	112.0	7.5	74	-	-	-
-	-	-	120.3	7.1	68	120.9	8.1	80	-	-	-
-	-	-	123.7	7.3	70	129.9	8.7	86	-	-	-

TABLE 42: 40 TON DRIVE ADJUSTMENT

10 HP Motor & 617 RPM Drive			15 HP Motor & 652 RPM Drive			20 HP Motor & 728 RPM Drive			25 HP Motor & 780 RPM Drive		
%RPM & CFM	Req'd PD	Browning 2B5V_ _	% RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _
91.8	4.5	42	88.2	4.5	44	82.5	4.7	46	83.7	5.1	50
95.9	4.7	44	92.1	4.7	46	86.0	4.9	48	86.9	5.3	52
100.0	(Std.) 4.9	46	96.0	4.9	48	89.5	5.1	50	90.2	5.5	54
104.1	5.1	48	100.0	(Std.) 5.1	50	93.0	5.3	52	93.4	5.7	56
108.2	5.3	50	103.9	5.3	52	96.5	5.5	54	96.7	5.9	58
112.2	5.5	52	107.8	5.5	54	100.0	(Std.) 5.7	56	100.0	(Std.) 6.1	60
116.3	5.7	54	111.7	5.7	56	103.5	5.9	58	103.3	6.3	62
-	-	-	115.6	5.9	58	107.0	6.1	60	106.6	6.5	64
-	-	-	119.5	6.1	60	110.5	6.3	62	109.8	6.7	66
-	-	-	123.4	6.3	62	114.0	6.5	64	113.1	6.9	68
-	-	-	127.4	6.5	64	117.5	6.7	66	116.4	7.1	70
-	-	-	-	-	66	121.1	6.9	68	119.7	7.5	74

TABLE 43: DRIVE ADJUSTMENT FOR POWER EXHAUST - 25 TON

5 HP Motor & 758 RPM Drive			7.5 HP Motor & 852 RPM Drive			10 HP Motor & 976 RPM Drive		
%RPM & CFM	Req'd PD	Browning 2b5v_ _	%RPM & CFM	Req'd PD	Browning 2b5v_ _	%RPM & CFM	Req'd PD	Browning 2b5v_ _
100	4.9 (Std.)	46	92	5.1	48	93	5.9	56
104	5.1	48	96	5.3	50	97	6.1	58
109	5.3	50	100	5.5 (Std.)	52	100	6.3 (Std.)	60
113	5.5	52	104	5.7	54	103	6.5	62
117	5.7	54	108	5.9	56	107	6.7	64
122	5.9	56	112	6.1	58	110	6.9	66

TABLE 44: DRIVE ADJUSTMENT FOR POWER EXHAUST - 30 & 40 TON

7.5 HP Motor & 852 RPM Drive			10 HP Motor & 976 RPM Drive			15 HP Motor & 1069 RPM Drive		
% RPM & CFM	REQ'D PD (in)	Browning 2B5V_ _	% RPM & CFM	REQ'D PD (in)	Browning 2B5V_ _	% RPM & CFM	REQ'D PD (in)	Browning 2B5V_ _
96.4	5.3	52	93.7	5.9	58	94.2	6.5	64
100.0	(Std.) 5.5	54	96.8	6.1	60	97.1	6.7	66
103.6	5.7	56	100.0	(Std.) 6.3	62	100.0	(Std.) 6.9	68
107.3	5.9	58	103.2	6.5	64	102.9	7.1	70
110.9	6.1	60	106.3	6.7	66	108.7	7.5	74
114.5	6.3	62	109.5	6.9	68	117.4	8.1	80

GAS FURNACE OPERATING INSTRUCTIONS

⚠ CAUTION

Each furnace module is equipped with an automatic re-ignition system. DO NOT attempt to manually light the burners.

TO LIGHT THE MAIN BURNERS

1. Turn off electric power to unit.
2. Turn space temperature sensor to lowest setting.
3. Turn gas valve knobs to on position (Refer to Figure 25).
4. Turn on electric power to unit.
5. On Constant Volume units, set space setpoint to warmer or cooler as desired. (If sensor set point temperature is above room temperature, the main burners will ignite). If a second stage of heat is called for, the main burners for second stage heat will ignite for the second stage heat. For VAV units set morning warm-up thermostat far above the return air temperature and cycle the time clock OFF, then ON.

TO SHUT DOWN

1. Turn off electric power to unit.
2. Depress knob of gas valve while turning to off position or move switch to off position. (Refer to Figure 25).

POST-START CHECKLIST (GAS)

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.
2. Check for correct manifold gas pressures. See Checking Gas Input.
3. Check the supply gas pressure. It must be within the limits shown on rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas pressure exceed 13 inches, nor the operating pressure drop below 6 inches. If gas pressure is outside these limits, contact the local gas utility for corrective action.

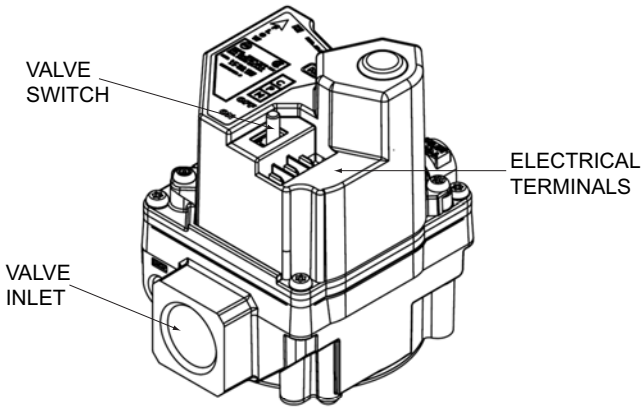
MANIFOLD GAS PRESSURE ADJUSTMENT

Small adjustments to the gas flow may be made by turning the pressure regulator adjusting screw on the automatic gas valve. Refer to Figure 25.

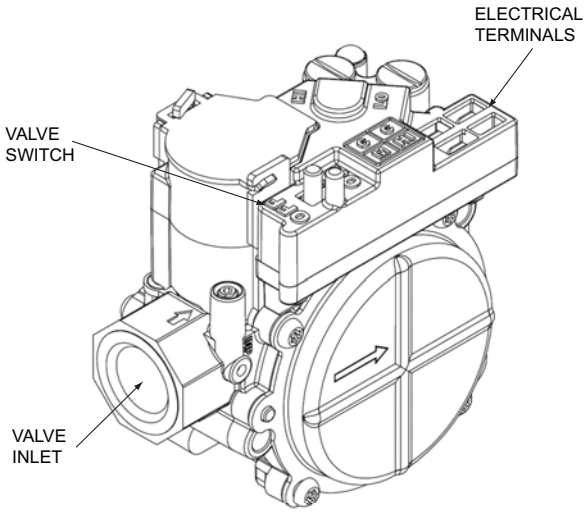
Adjust as follows:

1. Remove the cap on the regulator. It's located next to the push-on electrical terminals.
2. To decrease the gas pressure, turn the adjusting screw counterclockwise.
3. To increase the gas pressure, turn the adjusting screw clockwise.

NOTE: The factory manifold pressure for each furnace module is 3.50 IWG.



STANDARD GAS VALVE



2 STAGE GAS VALVE USED
ON MODULATING GAS HEAT

FIGURE 25 - TYPICAL GAS VALVES

BURNER INSTRUCTIONS

To check or change burners, pilot or orifices, CLOSE MAIN MANUAL SHUT-OFF VALVE AND SHUT OFF ALL POWER TO THE UNIT.

1. Remove the screws holding either end of the manifold to the burner supports.
2. Open the union fitting in the gas supply line just upstream of the unit gas valves and downstream from the main manual shut-off valve.
3. Disconnect wiring to the gas valves and spark ignitors. Remove the manifold-burner gas valve assemblies by pulling back.
4. Remove the heat shield on top of the manifold support.

Burners are now accessible for service.

Reverse the above procedure to replace the assemblies. Make sure that burners are level and seat at the rear of the gas orifice.

ADJUSTMENT OF TEMPERATURE RISE

The temperature rise (or temperature difference between the return air and the heated air from the furnace) must lie within the range shown on the CGA/ETL rating plate and the data in Table 3.

After the temperature rise has been determined, the CFM can be calculated as follows:

$$CFM = \frac{Btuh \times 0.8}{1.08 \times F\ Degrees\ Temp\ Rise}$$

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts (about six feet from the furnace) where they will not be affected by radiant heat. Increase the blower CFM to decrease the temperature rise; decrease the blower CFM to increase the rise. Refer to Table 34 for supply air blower motor and drive data. Minimum allowable CFM is 6,000 CFM. Limit will open below this rating.

CHECKING GAS INPUT

NATURAL GAS

1. Turn off all other gas appliances connected to the gas meter.
2. With the furnace turned on, measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter usually has a 1/2 or a 1 cubic foot test dial.
3. Using the number of seconds for each revolution and the size of the test dial increment, find the cubic feet of gas consumed per hour from Table 45.

If the actual input is not within 5% of the furnace rating (with allowance being made for the permissible range of the regulator setting), replace the orifice spuds with spuds of the proper size.

NOTE: To find the Btu input, multiply the number of cubic feet of gas consumed per hour by the Btu content of the gas in your particular locality (contact your gas company for this information - it varies widely from city to city).

TABLE 45: GAS RATE - CUBIC FEET PER HOUR

Seconds for One Rev.	Size of Test Dial	
	1/2 cu. Ft.	1 cu. Ft.
2	900	1800
4	450	900
6	300	600
8	225	450
10	180	360

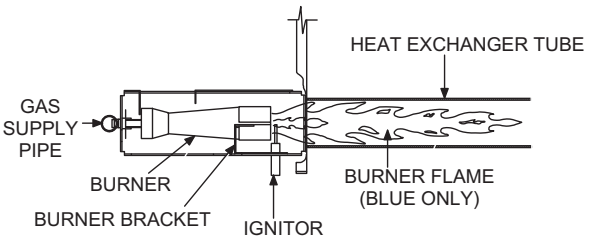


FIGURE 26 - TYPICAL FLAME APPEARANCE

Example: By actual measurement, it takes 7 seconds for the hand on the one cubic foot dial to make a revolution with just a 570,000 Btuh furnace running. Read across to the column in Table 24, headed 1 Cubic Foot where you will determine that 525 cubic feet of gas per hour are consumed by the furnace at that rate. Multiply 525 x 1050 (the Btu rating of the gas obtained from the local gas company). The result of 551,000 Btuh is within 5% of the 570,000 Btuh rating of the furnace.

ELECTRIC HEATING

The electric furnace is operational as shipped from the factory and does not receive any field adjustments.

COOLING OPERATING INSTRUCTIONS

COMPRESSOR

Compressors are factory mounted ready for operation (See page 59 Compressor Rotation).

INTERNAL WIRING

Check all electrical connections in the unit control box; tighten as required.

CONDENSER FANS

Check for proper condenser fan rotation; clockwise facing the air discharge. If condenser fans are rotating backwards, line voltage to unit single point power connection is misphased (See page 59 Compressor Rotation).

SERVICE

REFRIGERATION SYSTEM

CHARGE: Each system is fully factory charged with R-410A. The correct charge appears on the unit nameplate.

Thermal Expansion Valves: The 30 ton unit has 3 and the 40 ton unit has 4 independent refrigeration systems. These TXVs are set to maintain 15°F superheat leaving the evaporator coil. The superheat on each valve is adjustable, however, adjustments should only be made if absolutely necessary.

FILTER DRIER: Each system is equipped with a filter drier. The drier should be replaced whenever moisture is indicated in the system.

COMPRESSORS

Each compressor is inherently protected from over current and over temperature. High and low pressure switches are installed on the discharge and suction lines respectively for high and low pressure protection. Scroll compressors operate in only one direction. If the compressor is experiencing low amperage draw, similar discharge and suction pressure or increased noise level, it is operating in reverse. Switch two line voltage connections to correct (See Compressor Rotation page 59).

MOTORS

INDOOR BLOWER MOTORS

All indoor blower motors are non-inherently protected three phase motors. Overcurrent protection is provided by a manual reset starter/overload relay and short circuit protection is provided by fuses. Where there is a supply fan VFD, an auxiliary contact provides the overcurrent indication to the standard control.

POWER EXHAUST OR RETURN AIR FAN MOTORS

All motors are non-inherently protected three phase motors. Overcurrent protection is provided by a manual reset starter/overload relay and short circuit protection is provided by fuses.

CONDENSER FAN MOTORS

All condenser fan motors are inherently protected three phase motors. Short circuit protection is provided by fuses.

DRAFT MOTOR (GAS FURNACE)

All draft motors are line voltage, inherently protected, single phase PSC motors. Short circuit protection is provided by fuses.

TABLE 46: STEAM COIL (1 ROW, 25 & 30 TON)[1]

CFM	Capacity (MBH) at Steam Pressure (PSI)			
	2	6	10	15
6000	194.1	207.9	219.8	232.6
8000	221.1	236.9	250.4	265.0
10000	243.2	260.5	275.4	291.4
12000	261.9	280.6	296.6	313.9
15000	285.6	306.0	323.5	342.4

1. Based on 60°F entering air temperature, 2.00” maximum air pressure drop across the coil.

TABLE 47: STEAM COIL (1 ROW, 40 TON)[1]

CFM	Capacity (MBH) at Steam Pressure (PSI)			
	2	6	10	15
8000	221.1	236.9	250.4	265.0
11000	252.9	271.0	286.4	303.1
14000	278.2	298.0	315.0	333.4
17000	299.4	320.7	339.0	358.8
20000	317.6	340.2	359.6	380.6

1. Based on 60°F entering air temperature, 2.00” maximum air pressure drop across the coil.

TABLE 48: STATIC RESISTANCE STEAM COIL (25 & 30 TON)

CFM	6000	8000	10000	12000	15000
Air Pressure Drop	0.11	0.18	0.26	0.36	0.54

TABLE 49: STATIC RESISTANCE STEAM COIL (40 TON)

CFM	8000	11000	14000	17000	20000
Air Pressure Drop	0.18	0.31	0.48	0.67	0.88

TABLE 50: HOT WATER COIL (1 ROW 25 & 30 TON)[1]

GPM	CFM	Capacity (MBH) at Entering Water Temperature			
		140 °F	160 °F	180 °F	200 °F
10	6000	91.4	115.3	139.3	163.6
	8000	102	128.8	155.8	182.9
	10000	110.4	139.5	168.8	198.4
	12000	117.3	148.4	179.6	211.2
	15000	125.9	159.2	192.9	226.9
20	6000	103	129.4	156	182.7
	8000	116.8	147	177.2	207.7
	10000	128.2	161.3	194.7	228.2
	12000	137.8	173.6	209.5	245.6
	15000	150	189	228.2	267.8
30	6000	107.6	135	162.5	190.1
	8000	122.8	154.3	185.8	217.5
	10000	135.5	170.3	205.1	240.2
	12000	146.4	184	221.8	259.7
	15000	160.3	201.6	243	284.8
40	6000	110.1	138	166	194.1
	8000	126.1	158.2	190.5	222.8
	10000	139.6	175.2	210.9	246.8
	12000	151.2	189.8	228.5	267.5
	15000	166.1	208.6	251.3	294.1

1. Based on 60°F entering air temperature, 2.00” maximum pressure drop across the hot water coil.

TABLE 51: HOT WATER COIL (1 ROW, 40 TON)[1]

GPM	CFM	Capacity (MBH) at Entering Water Temperature			
		140 °F	160 °F	180 °F	200 °F
10	8000	102	128.8	155.8	182.9
	11000	114	144.1	174.4	205.1
	14000	123.2	155.9	188.8	222.1
	17000	130.6	165.4	200.4	235.8
	20000	136.8	173.3	210.1	247.3
20	8000	116.8	147	177.2	207.7
	11000	133.2	167.7	202.3	237.2
	14000	146.2	184.2	222.4	260.8
	17000	157	197.9	239	280.5
	20000	166.2	209.6	253.2	297.3
30	8000	122.8	154.3	185.8	217.5
	11000	141.2	177.4	213.8	250.3
	14000	155.9	196.1	236.4	276.9
	17000	168.3	211.8	255.4	299.3
	20000	179.1	225.3	271.8	318.6
40	8000	126.1	158.2	190.5	222.8
	11000	145.6	182.7	220	257.5
	14000	161.4	202.6	244.1	285.8
	17000	174.7	219.5	264.5	309.7
	20000	186.3	234.2	282.3	330.6

1. Based on 60°F entering air temperature, 2.00” maximum pressure drop across the hot water coil.

TABLE 52: WATER PRESSURE DROP (1 ROW, 25 & 30 TON)

GPM	10	20	30	40
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 53: WATER PRESSURE DROP (1 ROW, 40 TONS)

GPM	10	20	30	40
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 54: HOT WATER COIL (2 ROW, 25 & 30 TON)[1]

GPM	CFM	Capacity (MBH) at Entering Water Temperature			
		140 °F	160 °F	180 °F	200 °F
20	6000	177.5	223.8	270.4	317.3
	8000	203.8	257.2	311.1	365.5
	10000	224.8	284.1	343.9	404.2
	12000	242.2	306.4	371.1	436.4
	15000	263.6	333.8	404.6	476.1
40	6000	198.1	248.9	300.0	351.3
	8000	232.2	292.0	352.2	412.7
	10000	260.7	328.1	395.9	464.1
	12000	285.0	359.0	433.4	508.3
	15000	316.0	398.4	481.3	564.8
60	6000	206.1	258.7	311.4	364.2
	8000	243.6	305.9	368.4	431.1
	10000	275.3	345.9	416.8	488.0
	12000	302.9	380.7	458.9	537.6
	15000	338.4	425.7	513.4	601.7
80	6000	210.5	263.9	317.4	371.1
	8000	249.8	313.3	377.1	441.1
	10000	283.3	355.6	428.2	501.0
	12000	312.7	392.7	473.0	553.6
	15000	351.0	440.9	531.3	622.1

1. Based on 60°F entering air temperature, 2.00” maximum pressure drop across the hot water coil.

TABLE 55: WATER PRESSURE DROP (2 ROW, 25 & 30 TON)

GPM	20	40	60	80
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 56: WATER PRESSURE DROP (2 ROW, 40 TON)

GPM	20	40	60	80
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 57: STATIC RESISTANCE HOT WATER COIL (25 & 30 TON)

CFM	6000	8000	10000	15000
Air Pressure Drop 1 Row	0.07	0.11	0.16	0.32
Air Pressure Drop 2 Row	0.14	0.23	0.33	0.65

TABLE 58: STATIC RESISTANCE HOT WATER COIL (40 TON)

CFM	8000	11000	14000	20000
Air Pressure Drop 1 Row	0.11	0.19	0.29	0.52
Air Pressure Drop 2 Row	0.23	0.39	0.58	1.06

NOTE: Water pressure drop numbers are based on 60°F entering air temperature, 2.00” maximum air pressure drop across the hot water coil(s). AHRI certified ratings at covering other conditions are available upon request. Hot water coils are approved for use with glycol (rates available upon request.

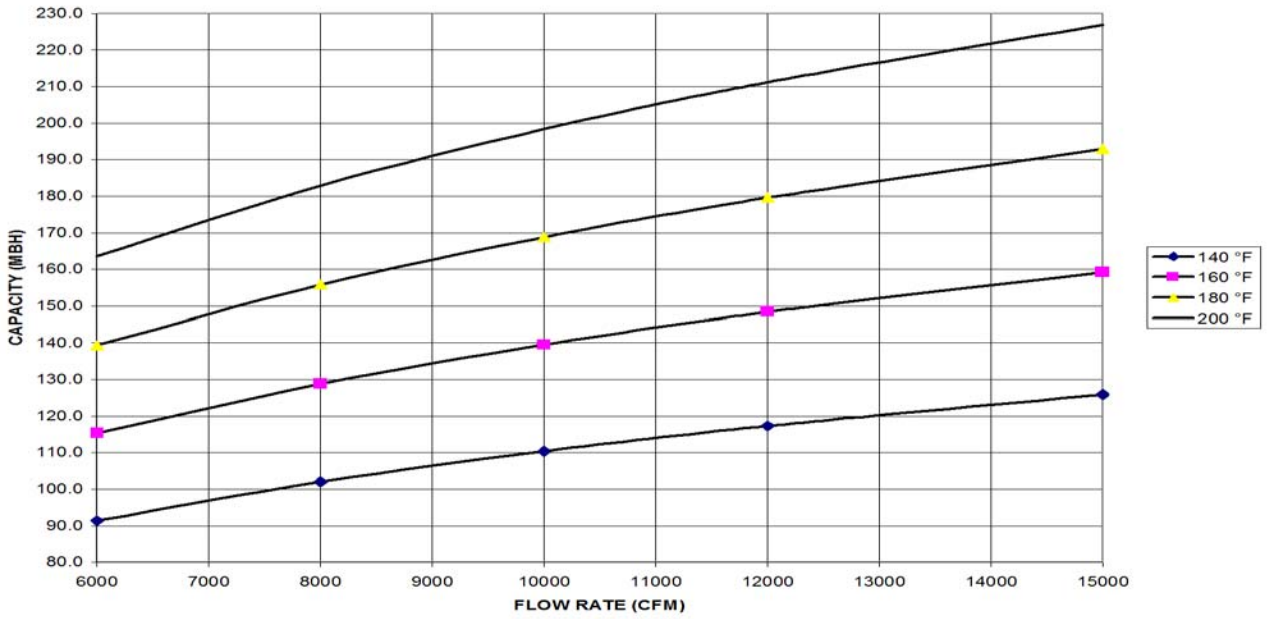


FIGURE 27 - HOT WATER COIL - 25 & 30 TON, 1 ROW, AT 10 GPM

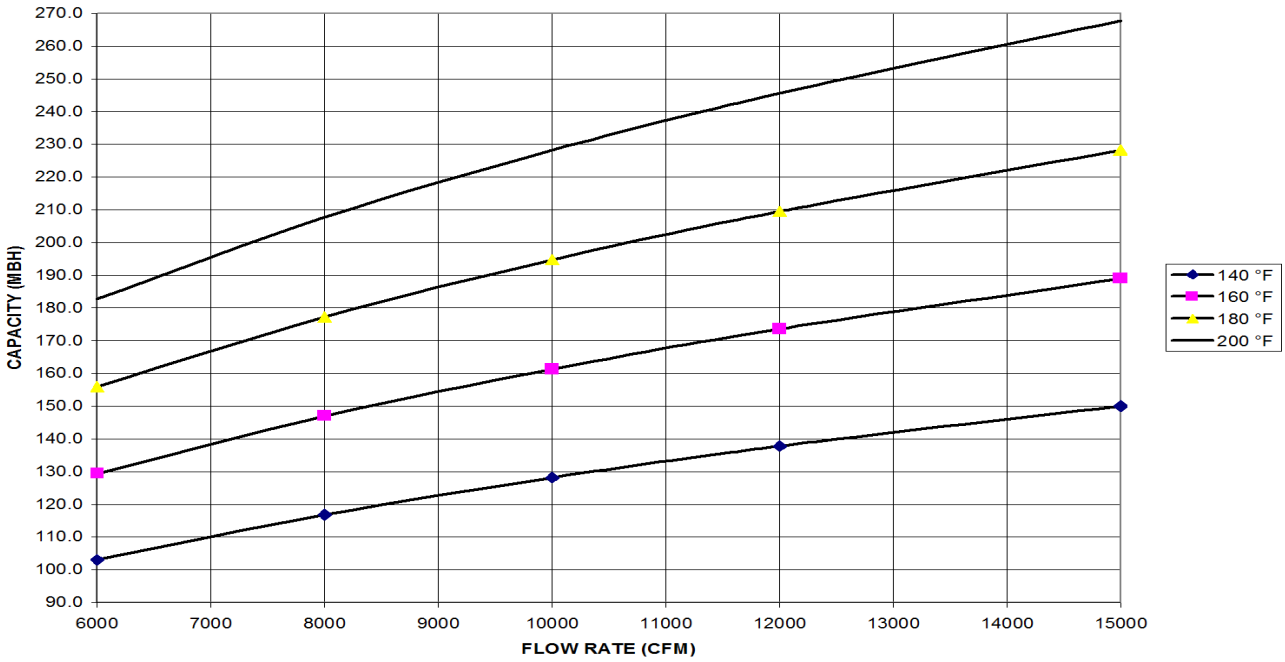


FIGURE 28 - HOT WATER COIL - 25 & 30 TON, 1 ROW, AT 20 GPM

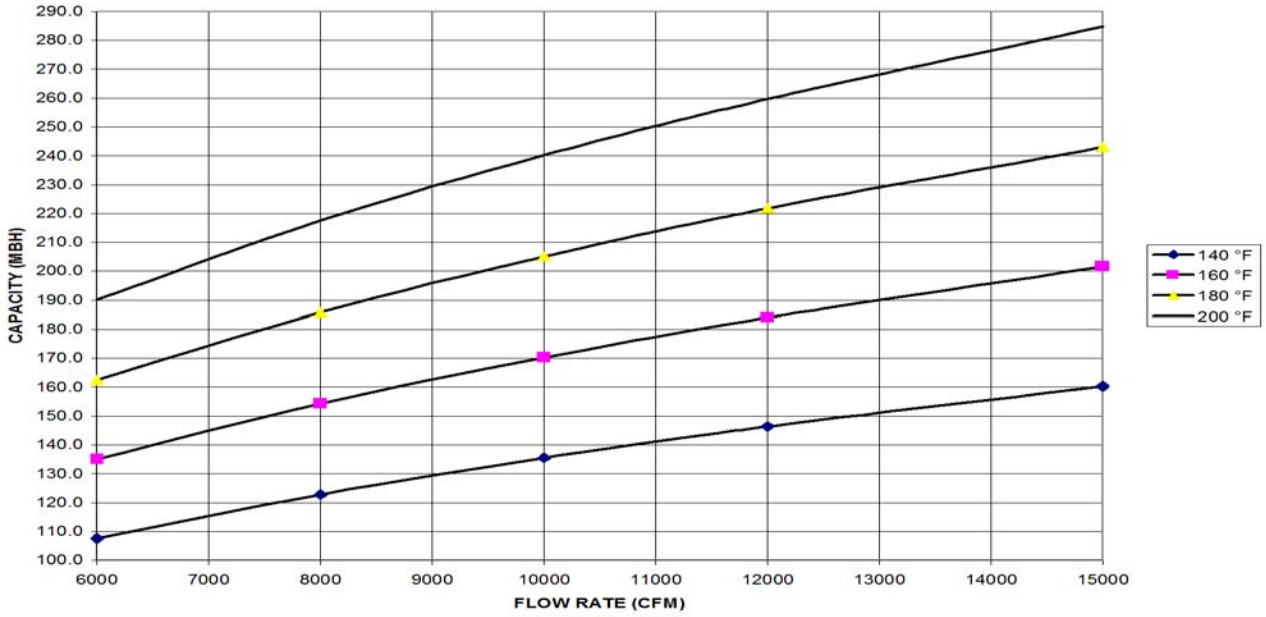


FIGURE 29 - HOT WATER COIL - 25 & 30 TON, 1 ROW, AT 30 GPM

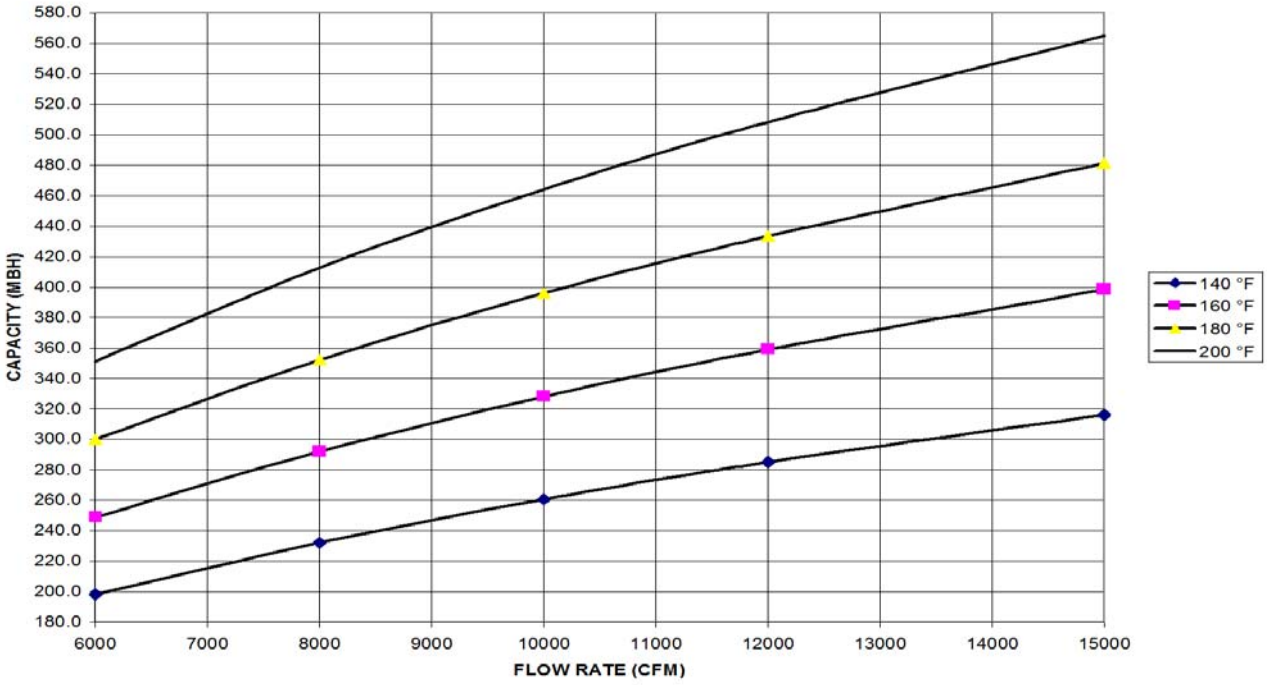


FIGURE 30 - HOT WATER COIL - 25 & 30 TON, 1 ROW, AT 40 GPM

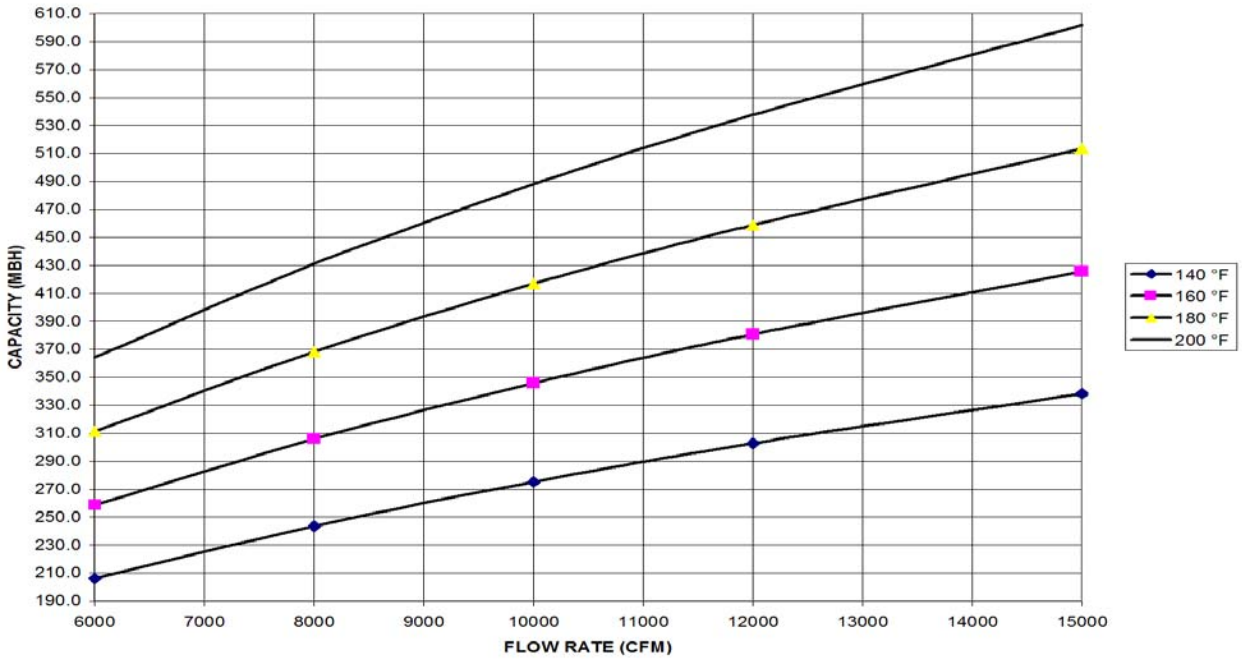


FIGURE 31 - HOT WATER COIL - 25 & 30 TON, 2 ROW, AT 60 GPM

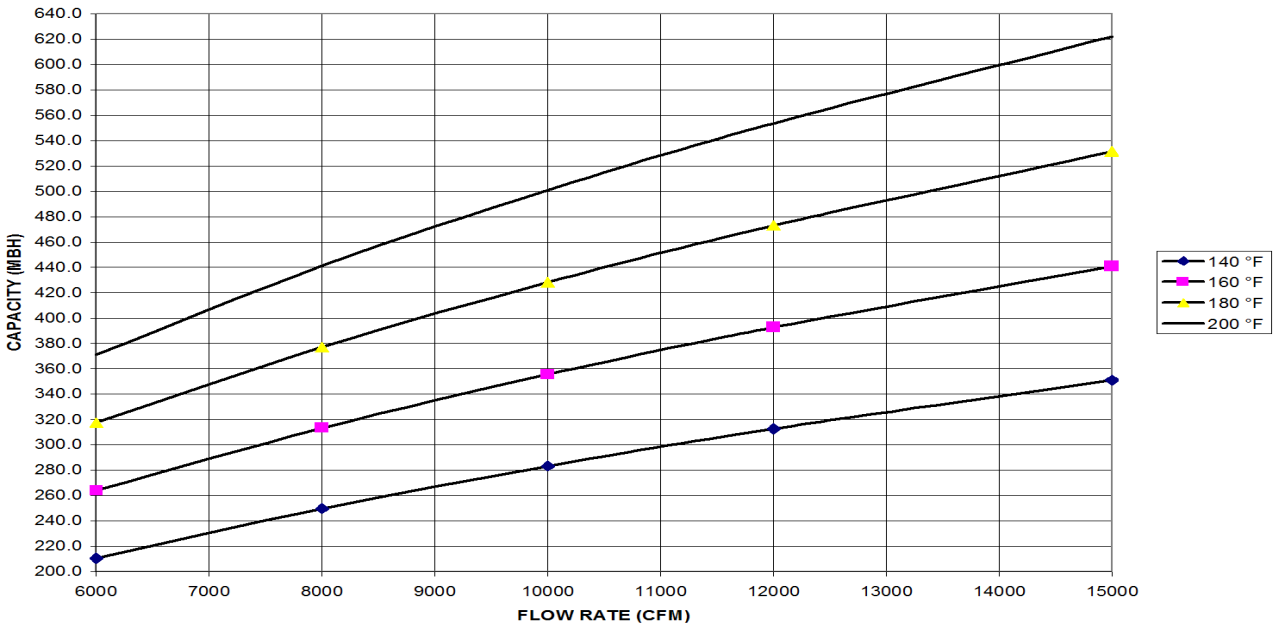


FIGURE 32 - HOT WATER COIL - 25 & 30 TON, 2 ROW, AT 80 GPM

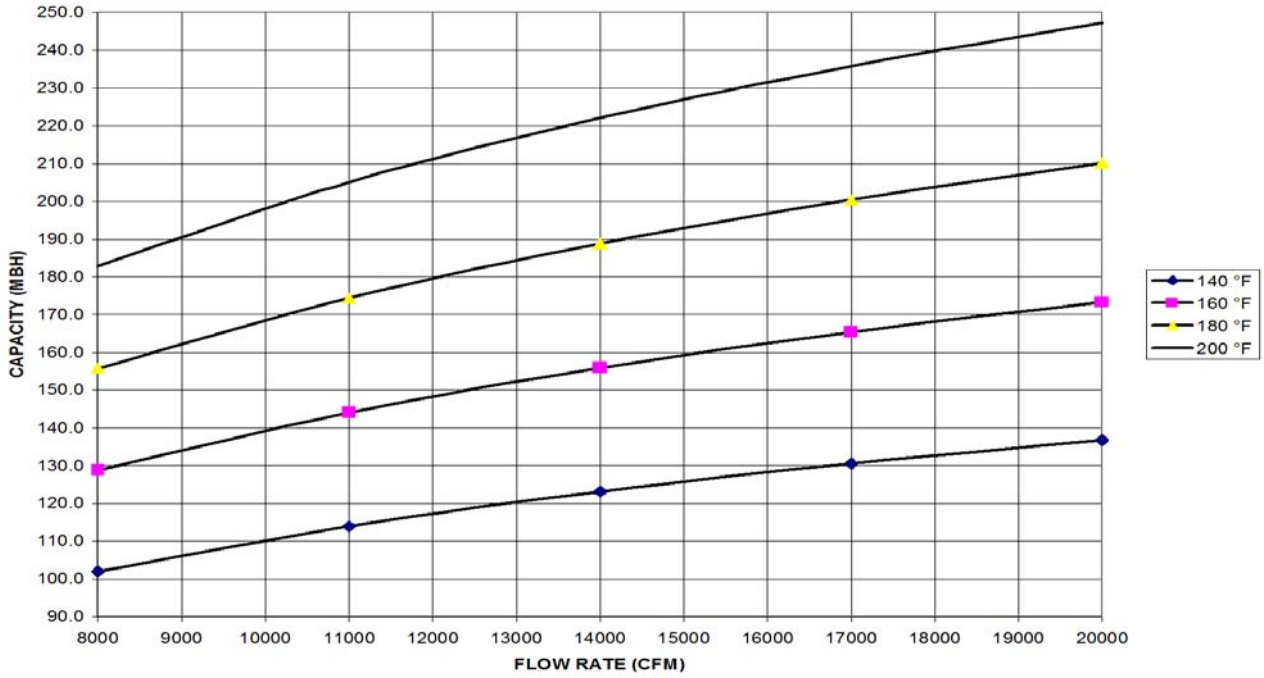


FIGURE 33 - HOT WATER COIL - 40 TON, 1 ROW, AT 10 GPM

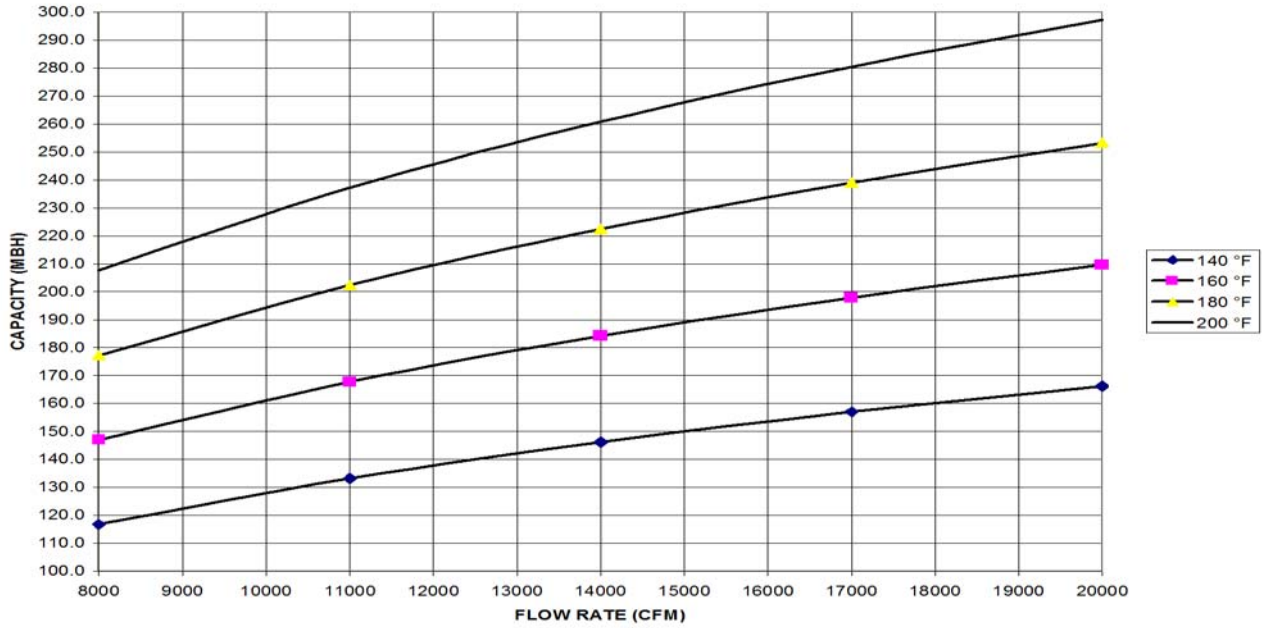


FIGURE 34 - HOT WATER COIL - 40 TON, 1 ROW, AT 20 GPM

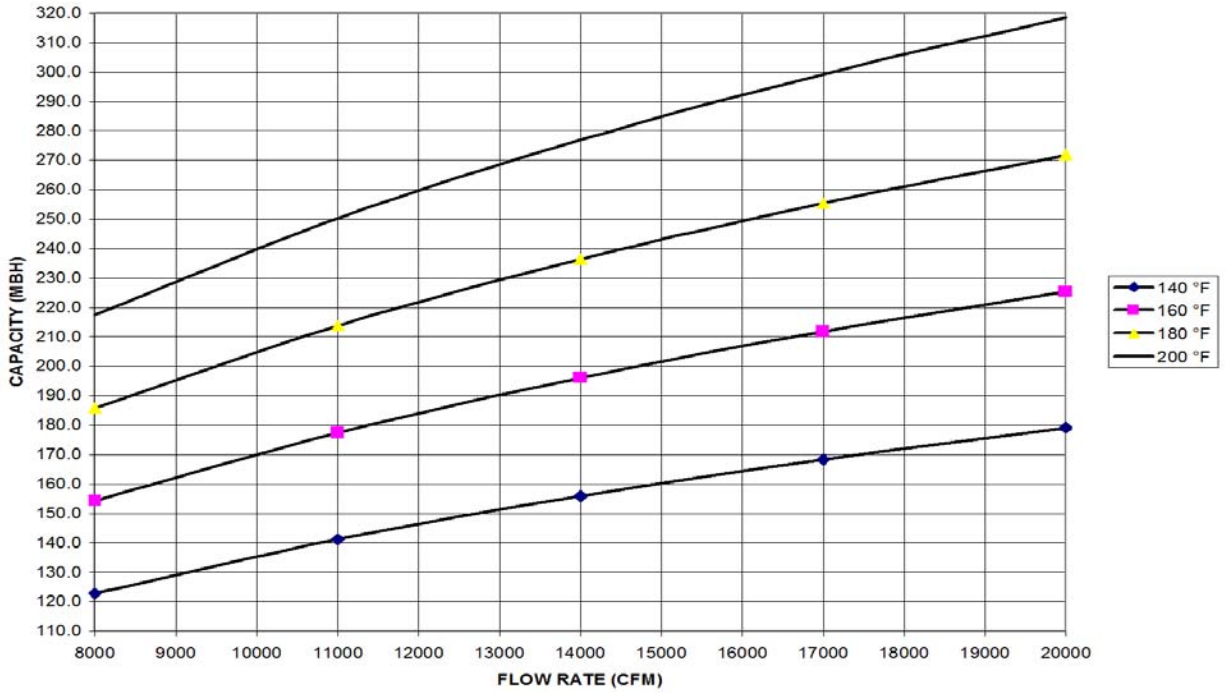


FIGURE 35 - HOT WATER COIL - 40 TON, 1 ROW, AT 30 GPM

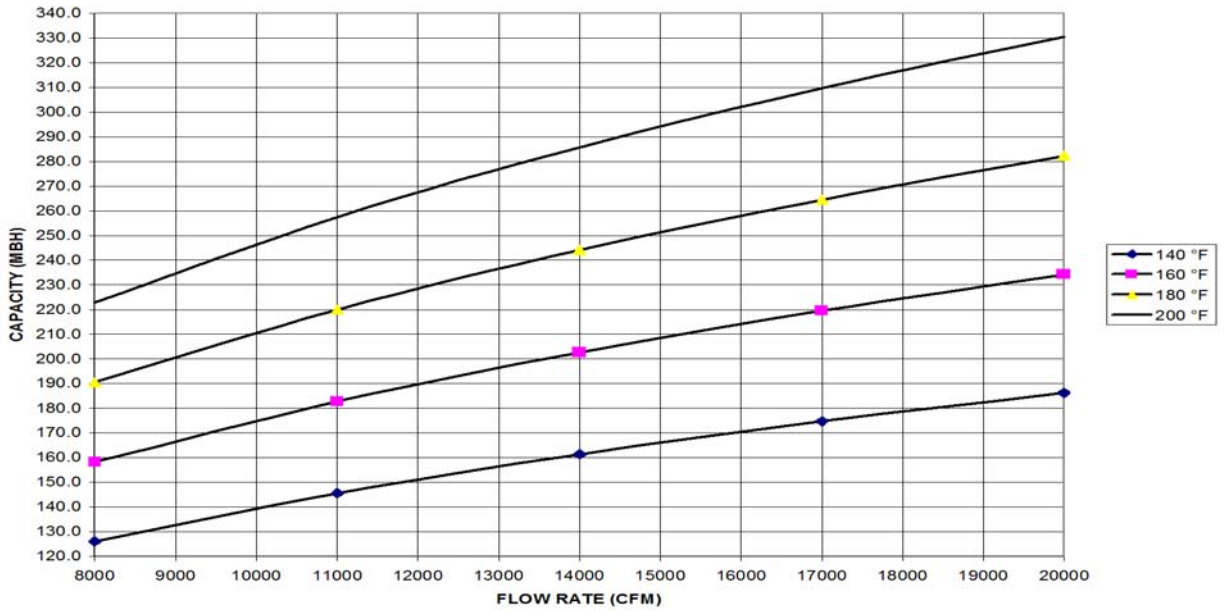


FIGURE 36 - HOT WATER COIL - 40 TON, 1 ROW, AT 40 GPM

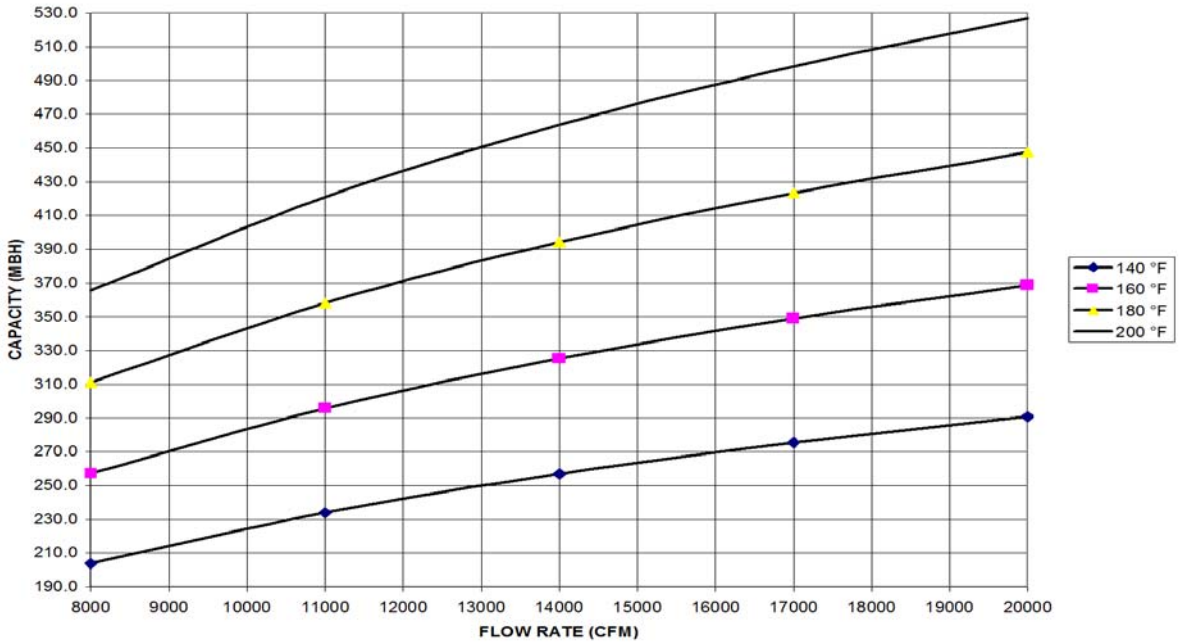


FIGURE 37 - HOT WATER COIL - 40 TON, 2 ROW, AT 20 GPM

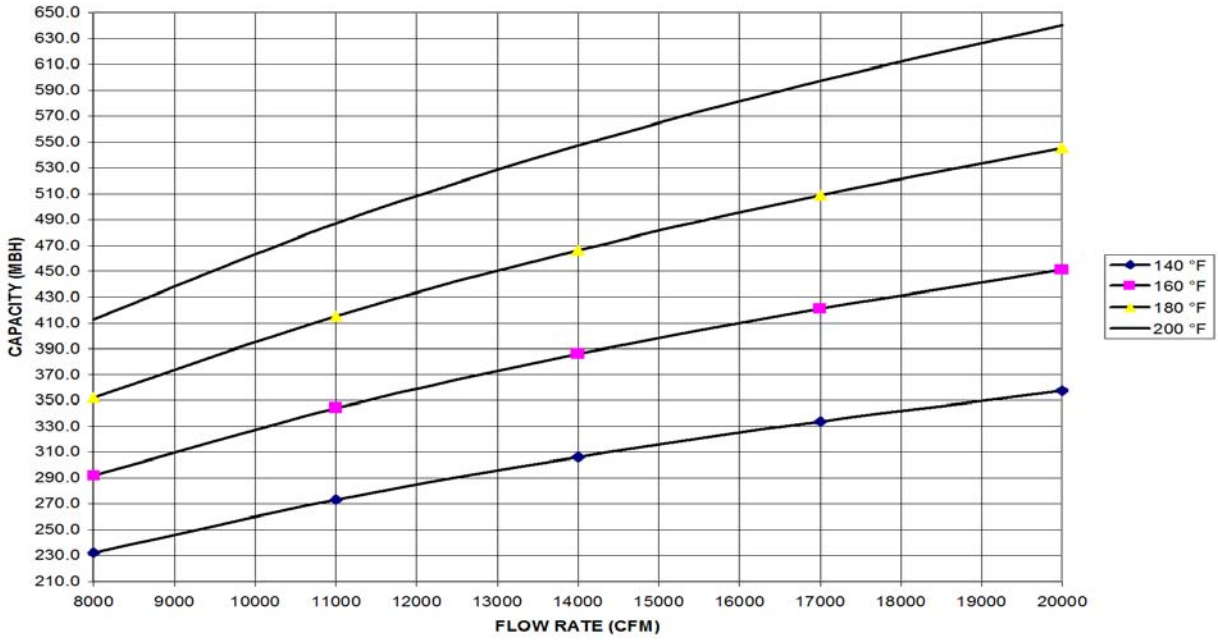


FIGURE 38 - HOT WATER COIL - 40 TON, 2 ROW, AT 40 GPM

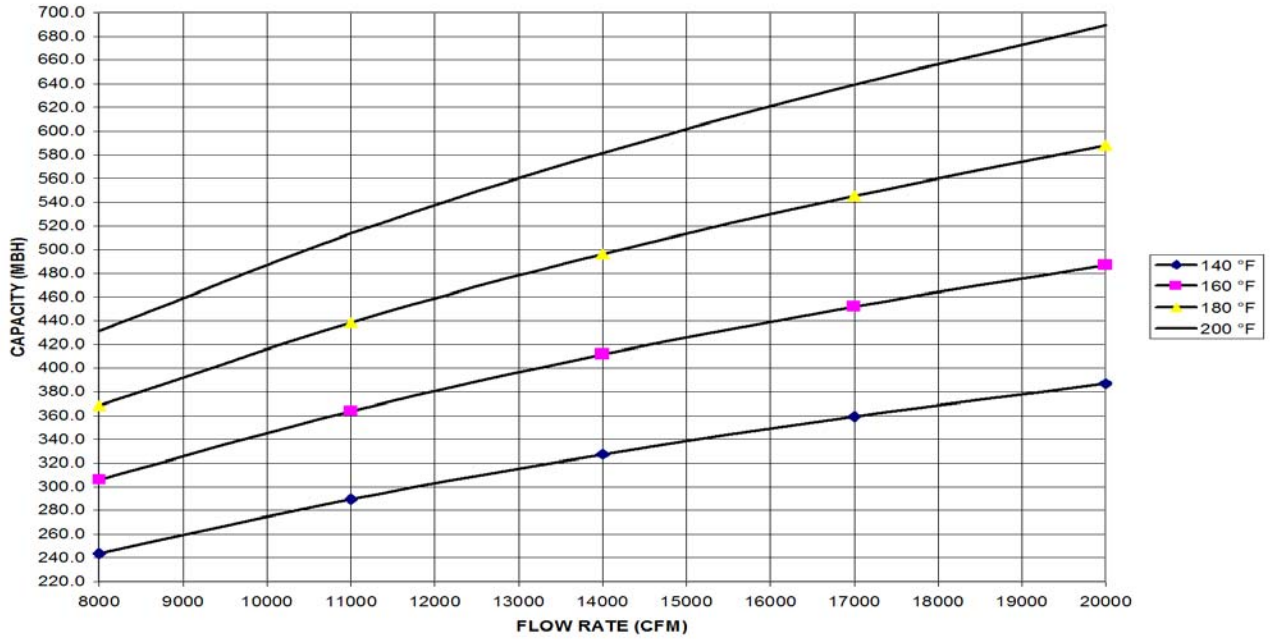


FIGURE 39 - HOT WATER COIL - 40 TON, 2 ROW, AT 60 GPM

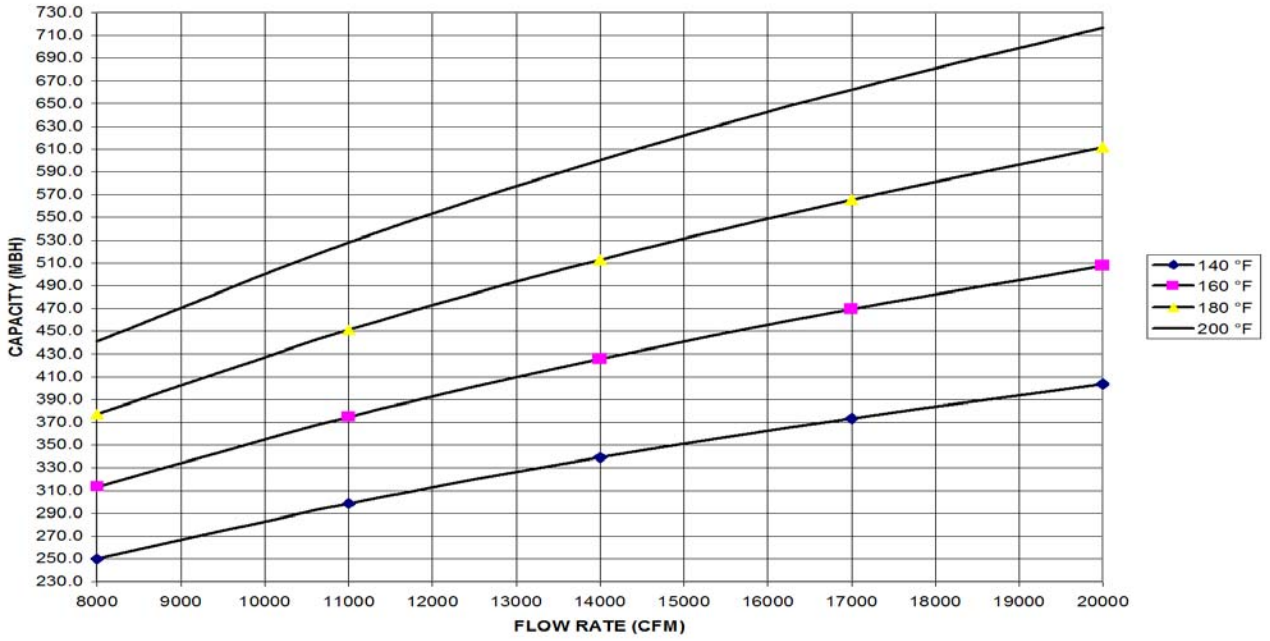


FIGURE 40 - HOT WATER COIL - 40 TON, 2 ROW, AT 80 GPM

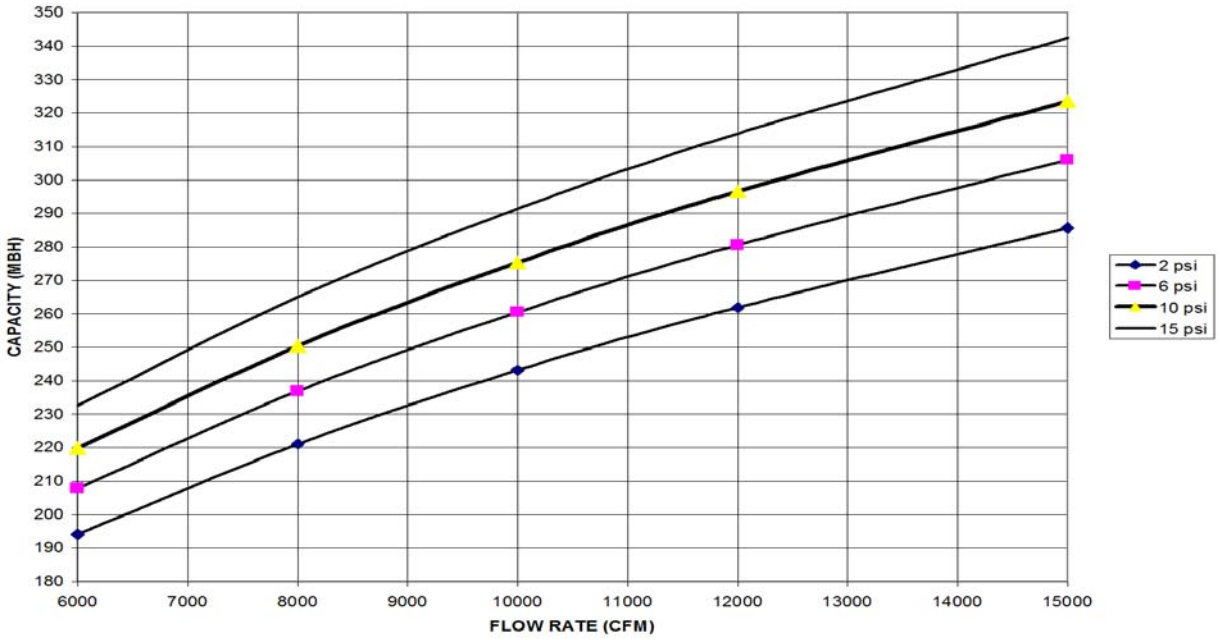


FIGURE 41 - STEAM COIL - 25 & 30 TON (1 ROW)

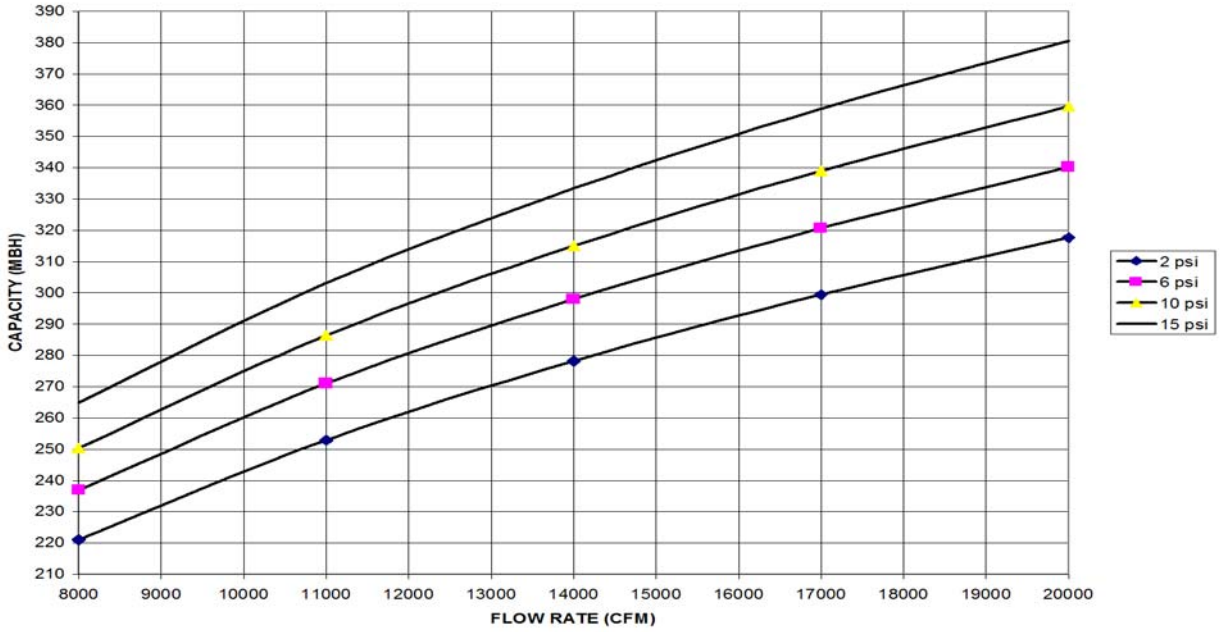


FIGURE 42 - STEAM COIL - 40 TON (1 ROW)

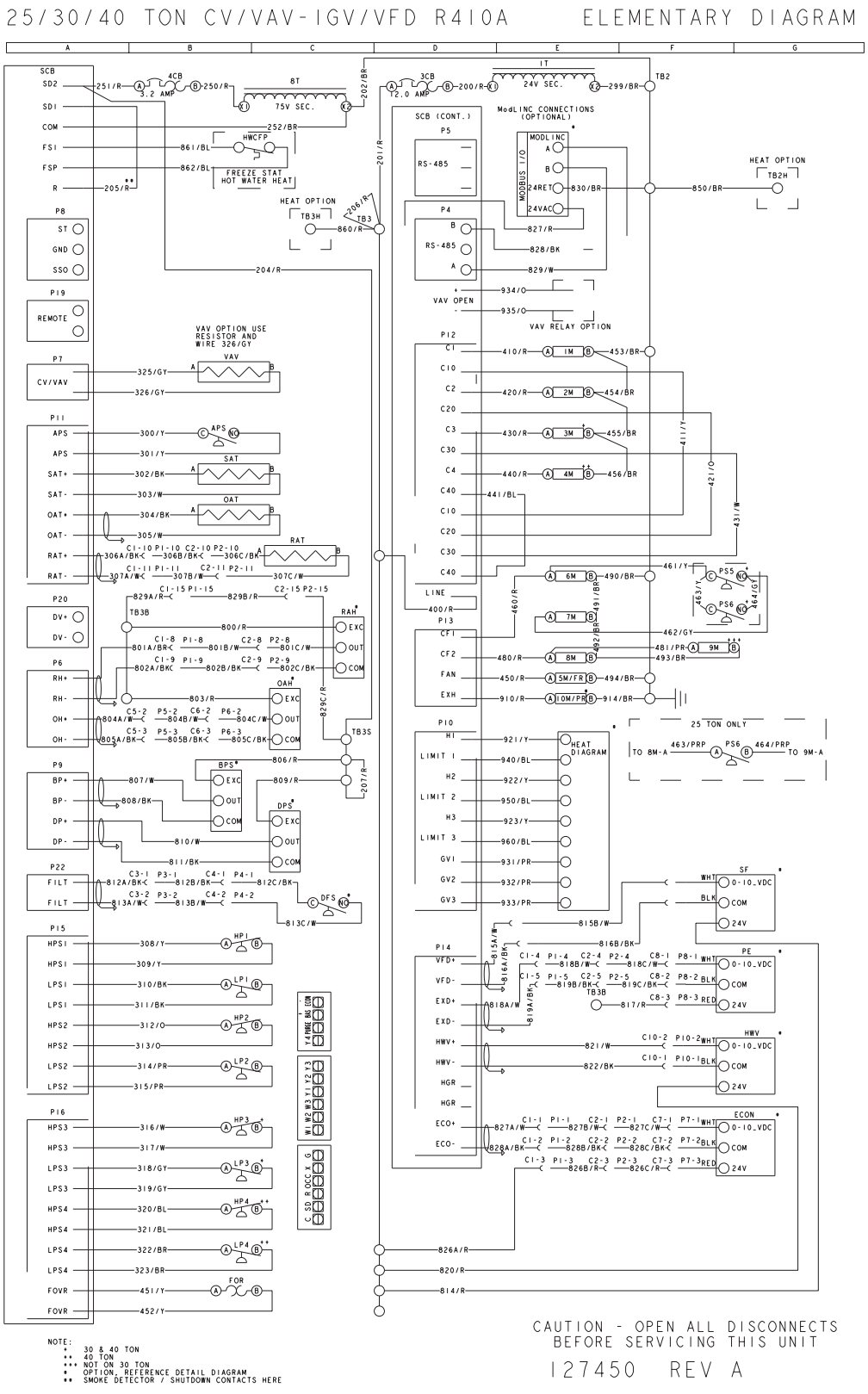

25/30/40 TON CV/VAV-IGV/VFD R410A ELEMENTARY DIAGRAM
CAUTION - OPEN ALL DISCONNECTS BEFORE SERVICING THIS UNIT
I27450 REV A

FIGURE 43 - TYPICAL CONTROL WIRING

LEGEND

1M	CONTACTOR, COMPRESSOR No.1
2M	CONTACTOR, COMPRESSOR No.2
3M	CONTACTOR, COMPRESSOR No.3
4M	CONTACTOR, COMPRESSOR No.4
5M	STARTER, INDOOR BLOWER
6M	CONTACTOR, CONDENSER FAN No.1
7M	CONTACTOR, CONDENSER FAN No.2
8M	CONTACTOR, CONDENSER FAN No.3
9M	CONTACTOR, CONDENSER FAN No.4
10M	STARTER, POWER EXHAUST FAN
2CB	BREAKER, CIRCUIT 20.0 AMP
3CB	BREAKER, CIRCUIT 12.0 AMP
4CB	BREAKER, CIRCUIT 3.2 AMP
1-29FU	FUSES (SEE CHART FOR AMP.)
1T	TRANSFORMER, 24V SEC.
2T	TRANSFORMER, 240V SEC. (GAS HEAT)
4T	TRANSFORMER, 120V OUTLET
5T	TRANSFORMER, ISOLATION (1:1)
7T	TRANSFORMER, 2KVA
8T	TRANSFORMER, 75V SEC.
ECON	ACTUATOR, ECONOMIZER
PE	ACTUATOR, POWER EXHAUST DAMPERS / VFD
SF	ACTUATOR, INLET GUIDE VANES / VFD
HWV	ACTUATOR, HOT WATER VALVE
APS	SWITCH, AIR PROVING
BPS	BUILDING PRESSURE SENSOR
C1..C10	CAP, MATE-N-LOCK FEMALE CONNECTOR
CCH1-4	CRANKCASE HEATER
DFS	SWITCH, DIRTY FILTER
DPS	DUCT PRESSURE SENSOR
DM	MOTOR, DRAFT FAN (GAS HEAT)
DS	SWITCH, POWER DISCONNECT
FOVR	RELAY, FAN OVER LOAD
FR	RELAY, SPDT 24V COIL
GV1-3	GAS VALVE (GAS HEAT)
HPI-4	SWITCH, HIGH PRESSURE, AUTOMATIC RESET
HR	RELAY, SPDT 24V COIL
HWCFP	HOT WATER COIL FREEZE PROTECTION
IC1-3	MODULE, IGNITION CONTROL
IGV	INLET GUIDE VANES
LPI-4	SWITCH, LOW PRESSURE, AUTOMATIC RESET
LSI-3	SWITCH, LIMIT (GAS HEAT)
OAH	OUTSIDE AIR HUMIDITY
OAT	OUTDOOR AIR TEMPERATURE
OL	OVERLOAD (SEE CHART FOR DESIGNATIONS)
P1..P10	PLUG, MATE-N-LOCK, MALE CONNECTOR
PR	POWER EXHAUST PERMIT RELAY
PSI-3	SWITCH, PRESSURE - MAKES @ 0.33 IWC (GH)
PS5	SWITCH, HEAD PRESSURE (FAN CYCLING/SYS.1)
PS6	SWITCH, HEAD PRESSURE (FAN CYCLING/SYS.2)
RAH	RETURN AIR HUMIDITY
RAT	RETURN AIR TEMPERATURE
RSI-3	SWITCH, ROLLOUT (GAS HEAT)
SDC	DIGITAL, SYNTHESIS CONTROLLER, VAV
SAT	SUPPLY AIR TEMPERATURE
TB1	TERMINAL BLOCK, MAIN POWER
TB2	TERMINAL BLOCK, 24V COMMON
TB2H	TERMINAL BLOCK, HEAT OPTION
TB3	TERMINAL BLOCK
TB3-6	TERMINAL BLOCK
TB3B	TERMINAL BLOCK
TB3H	TERMINAL BLOCK, HEAT OPTION
TB3L	TERMINAL BLOCK
TB3S	TERMINAL BLOCK
TB7	TERMINAL GROUNDING
TB9	TERMINAL GROUNDING
VFD	VARIABLE FREQUENCY DRIVE
VFDC	VARIABLE FREQUENCY DRIVE CONTROL HEAD PRESSURE
VFDI	INDOOR BLOWER MOTOR VFD (OPTIONAL)
VFDP	VARIABLE FREQUENCY DRIVE CONTROL POWER EXHAUST

NOTES:

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT TIME OF INSTALLATION OF THIS UNIT.
2. CAUTION: LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION . IF ANY OF THE WIRE AS SUPPLIED WITH THIS UNIT MUST BE REMOVED, IT MUST BE REPLACED WITH TYPE 105 DEGREE C, 600 VOLT WIRE OR EQUIVALENT.CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. ALL MOTORS ARE PROTECTED UNDER PRIMARY, SINGLE PHASE CONDITION. ALL CONDENSER FAN MOTORS ARE INTERNALLY PROTECTED. COMPRESSORS ARE PROTECTED BY A SOLID STATE DEVICE MOUNTED IN THE COMPRESSOR TERMINAL BOX. THE POWER EXHAUST AND SUPPLY FAN MOTORS ARE PROTECTED THROUGH THE 5M, 10M STARTERS.SEE THE CHART BELOW FOR THE MANUFACTURER AND PART NUMBER OF THE OVERLOAD HEATERS.
4. SEE UNIT NAMEPLATE FOR MAXIMUM OVERCURRENT PROTECTIVE DEVICE SIZE AND MINIMUM CIRCUIT AMPACITY.
5. 208/230V UNIT TRANSFORMERS ARE FACTORY WIRED FOR 230V, SEE BELOW FOR 208V 380V-60HZ UNIT TRANSFORMERS ARE FACTORY WIRED FOR 380V 380/415-50HZ UNIT TRANSFORMERS ARE FACTORY WIRED FOR 415V.SEE BELOW FOR 380V
   FOR A 208V SUPPLY, MOVE WIRE 132/R TO TERMINAL H2 ON 1T.
   FOR A 208V SUPPLY, MOVE WIRE 710/R TO TERMINAL H2 ON 4T.
   FOR A 380V SUPPLY, MOVE WIRE 132/R TO TERMINAL H2 ON 1T.
   FOR A 380V SUPPLY, MOVE WIRE 715/BR TO TERMINAL H2 ON 2T.
   FOR A 380V SUPPLY, MOVE WIRE 710/R TO TERMINAL H2 ON 4T.
6. SET THE A/B SWITCH ON ACT3 TO THE "B" POSITION. WHEN ECONOMIZER IS INSTALLED. SET THE L/R SWITCH ON ACT1 TO THE "R" POSITION.
7. WHEN USING THE DEMAND VENTILATION CO2 OVERRIDE. THE CO2 SENSOR MUST BE POWERED BY AN ISOLATED TRANSFORMER.

———— FACTORY WIRING AND DEVICES

— · · — OPTIONAL WIRING AND DEVICES

- —— FIELD WIRING AND DEVICES

FURNAS- OVERLOAD HEATER ELEMENT PART No.S					
	60 HZ				50HZ
MOTOR H.P.	208/230V	460V	575V	380-60HZ	380/415
5 HP	K57	K43	K39	K50	K50
7.5 HP	K67	K53	K50	K56	K54
10 HP	K70	K57	K54	K60	K58
15 HP	K74	K63	K61	K67	K64
20 HP	K77	K69	K63	K70	K70
25 HP	K83	K72	K69	K73	K73

(3 REQUIRED PER 5M OR 10M STARTER)

PRESSURE CONTROLS				
DEVICE	OPERATING PRESSURE (PSIG)			
	OPEN	+/-	CLOSE	+/-
HPI - 4	625	10	500	
LPI - 4	50	5	71	5
PS5	300	10	360	10

TEMPERATURE CONTROLS				
DEVICE	CONTROL SETPOINT (DEG F)			
	OPEN	+/-	CLOSE	+/-
RSI-2	200	12	---	---
LSI-2	150	5	130	7
LSI-3 700 MBH	160	6	130	9
CLO1	40	5	50	6
CLO2	0	5	10	6

FUSE SIZE (AMPS)**SEE NOTE 4**							
		60 HZ				50HZ	
FUSE	HP	208/230V	460V	575V	380V	380/415	CLASS
1-12FU (25T)	--	35	20	20	25	20	RK-5
1-12FU (30T)	--	50	25	20	30	25	RK-5
1-12FU (40T)	--	60	30	25	40	30	RK-5
13-15FU	7.5	35	15	12	20	20	RK-5
" "	10	50	25	20	25	25	RK-5
" "	15	70	35	25	40	40	RK-5
" "	20	100	40	35	50	50	RK-5
" "	25	110	50	40	60	60	RK-5
16-18FU(25T)	--	30	15	12	20	15	RK-5
16-18FU(30-40T)	--	40	20	15	25	20	RK-5
16-18FU(K units 25T)	--	8	4	--	--	--	RK-5
16-18FU (K units 30-40T)	--	10	5	--	--	--	CC
19-21FU	5	25	12	10	12	12	RK-5
" "	7.5	35	15	12	20	20	RK-5
" "	10	50	25	20	25	25	RK-5
" "	15	70	35	25	40	40	RK-5
22-23FU	--	3	1.5	1.5	1.5	1.5	CC-600V
24-25FU	--	4	3	2.5	3	3	CC-600V
28-29FU	--	30	15				CC-600V
26-27FU	--		3 (250V)				*SPL1
30FU	--		10 (250V)				*SPL2
50FU (25T HPC)	--	35	15	20	25	25	RK-5

ALL CLASS RK-5 FUSES ARE RATED AT 250V FOR 208/230V UNITS AND AT 600VAC FOR ALL OTHER VOLTAGES.
ALL CLASS CC FUSES ARE RATED AT 600VAC
*SPL2- REPLACE 30FU (10A, 250V) WITH BUSSMAN MDL10, GOULD SHAWNUT GDL10
*SPL1- REPLACE 26-27FU (3A, 250V) WITH BUSSMAN MDL3, GOULD SHAWNUT GDL3, LITTLEFUSE 313003
**- VALUES REFLECT FUSE SIZES FOR UNITS WITH (IGV/VFD)

CAUTION: OPEN ALL DISCONNECTS BEFORE SERVICING THIS UNIT

G162695A REV. B

FIGURE 44 - LEGEND

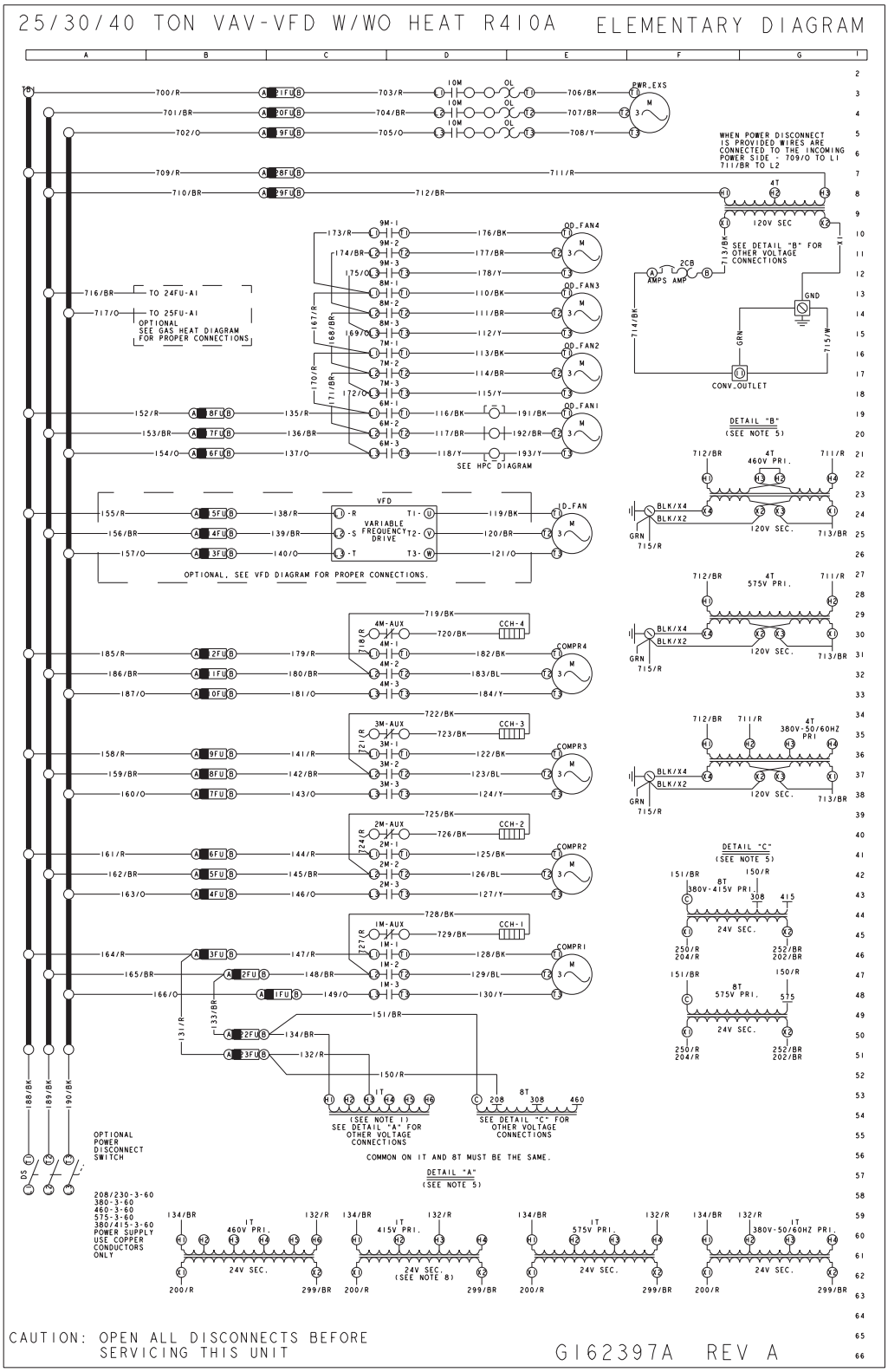


FIGURE 45 - TYPICAL 25 TON POWER WIRING

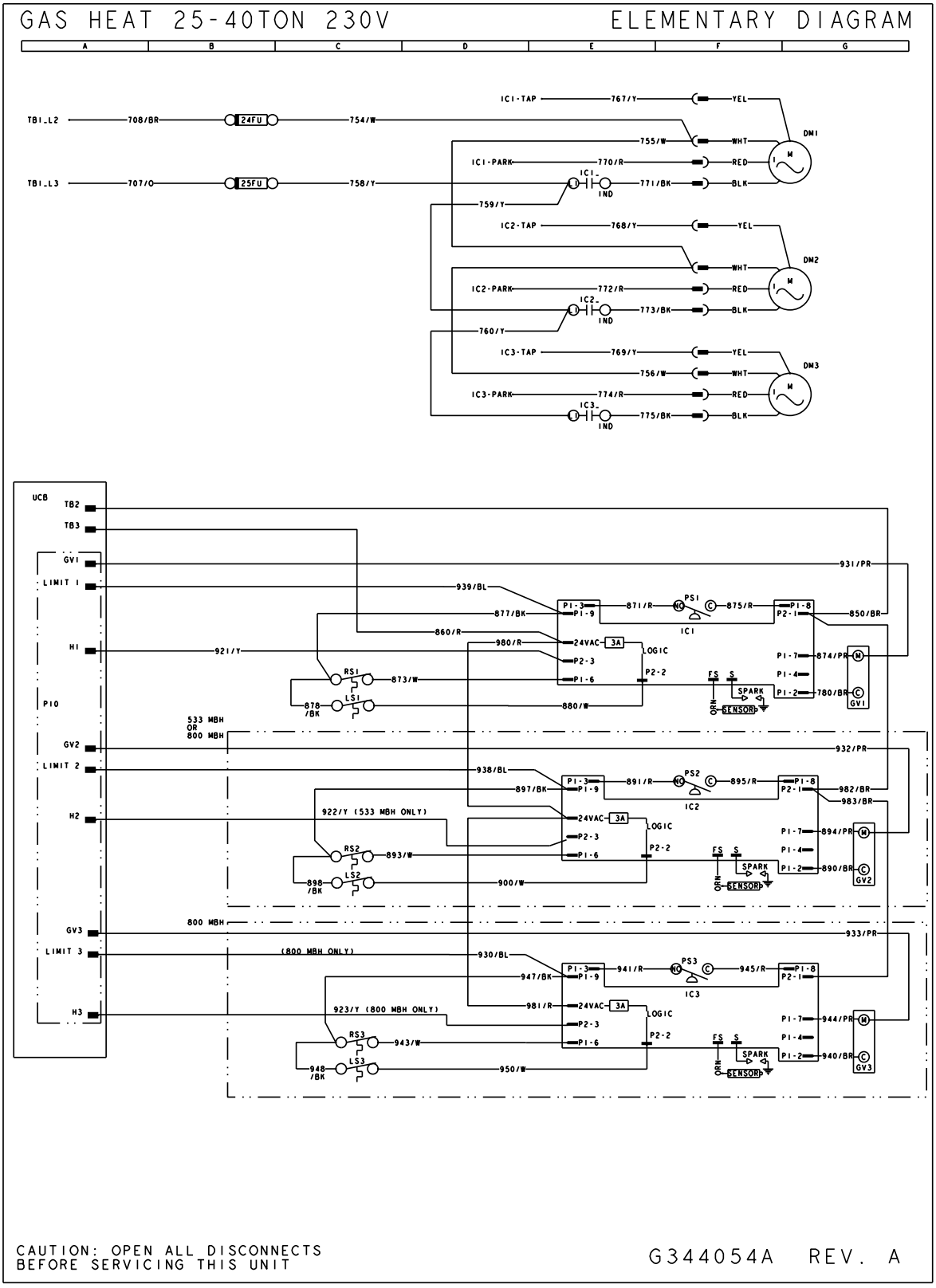


FIGURE 46 - TYPICAL STANDARD GAS HEAT WIRING

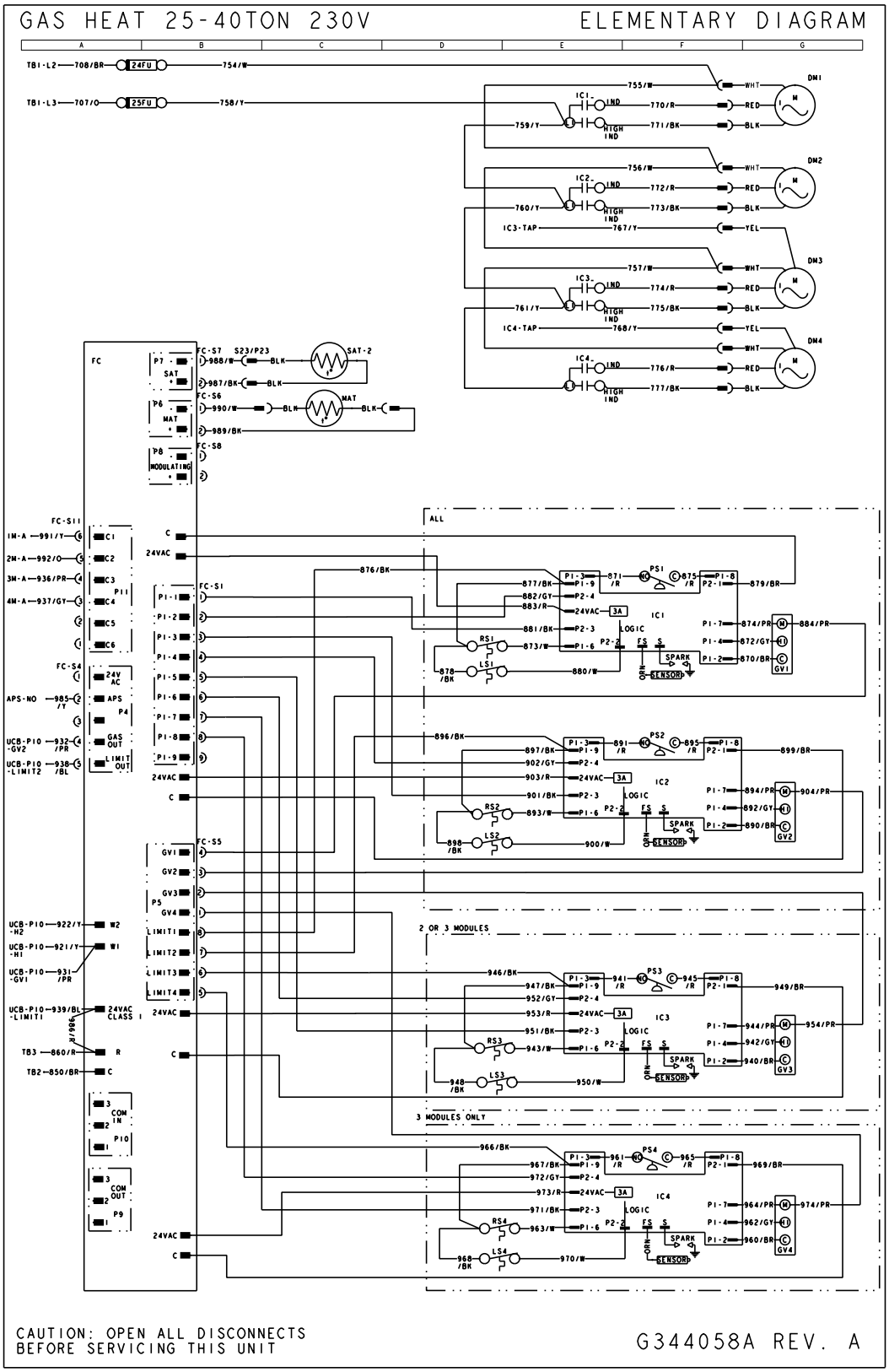


FIGURE 47 - TYPICAL MODULATING GAS HEAT WIRING

GAS FURNACE SAFETY FEATURES

COMBUSTION AIR PROVING

Combustion air proving is provided by a pressure switch. As the motor approaches full speed, this switch closes before any other circuit or gas component can be energized.

ROLLOUT

Rollout protection is provided by a switch mounted on the heat shield of each furnace module. The switch senses any flame or excessive heat in the burner compartment. When the switch opens, the furnace module is immediately locked out until there is a break in power to the specific furnace module and the manual itch is reset. Note that only the module with the open rollout switch will be locked out, the remaining modules will continue to operate although all should be inspected.

A trip of the rollout switch likely indicates a flue restriction, an opening in the flue passageway, defective pressure switch or a loose combustion blower wheel. Corrective action should be taken accordingly.

MAINTENANCE

NORMAL MAINTENANCE

⚠ CAUTION

Prior to any of the following maintenance procedures, shut off all power to the unit. Failure to do so could cause personal injury.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

Periodic maintenance normally consists of changing or cleaning filters and (under some conditions) cleaning the main burners.

FILTERS

Inspect once a month. Replace disposable or clean permanent type as necessary. The dimensional size of the replacement filter must be the same as the replaced filter (Refer to Table 15).

MOTORS

Outdoor fan motors are permanently lubricated and require no maintenance. Lubrication, if desired, is to be performed by a qualified service agency.

Ventor motors are factory lubricated for an estimated 10-year life.

Indoor Fan Motors - The indoor blower motor features ball-bearings that do not require periodic lubrication. Periodic lubrication of the motor bearings can extend the life but is optional.

⚠ CAUTION

Damage can occur if the bearings are over lubricated. Use grease sparingly.

To go to bypass mode, the bypass VFD as installed in this unit must be switched by hand on the front of the bypass enclosure in the fan cabinet of the rooftop unit. It does not automatically go to bypass mode if the drive fails.

The switches on the front of the bypass box control its run mode. For normal running:

- The ON/OFF rotary power switch must be in the ON position.
- The BYPASS/OFF/DRIVE switch S1 should be in the DRIVE position.
- The HAND/STOP/AUTO switch S2 should be in the AUTO position, so that the unit control will properly run the fan and control the speed.
- The TEST/NORMAL switch S3 should be in the NORMAL position.

⚠ CAUTION

If the unit is operated with the manual bypass switch in the LINE (BYPASS) position and there are VAV boxes present, the boxes must be driven to the full-open position using a customer-supplied power source to prevent over-pressuring the ductwork.

⚠WARNING

Perform all maintenance operations on the blower motor with power disconnected from the unit. Do not attempt to lubricate bearings with the unit in operation.

TABLE 59: INDOOR BLOWER BEARING LUBRICATION SCHEDULE

Shaft Size (Inches)	Operating Speed (RPM)			
	500	1000	1500	2000
	Relubrication Cycle (Months)			
1-1/16 - 1-7/16	6	6	6	6
1-1/2 - 1-3/4	6	6	6	4
1-7/8 - 2-3/16	6	6	4	4
2 -1/4 - 3	6	4	4	2

On an annual basis, check the motor for accumulations of dust, etc. That may block the cooling slots in the motor shell. Check for loose, damaged or misaligned drive components. Check that all mounting bolts are tight. Replace defective parts as required.

If desired, every three years remove both pipe plugs at each end shell and clean out any hardened grease or foreign matter. Replace one plug on each end with a clean grease fitting. Using a low pressure grease gun, pump grease (Chevron SRI-2 or equivalent) into the bearing cavity until new grease shows at the open port. Do not over-lubricate. Run the motor for ten minutes until excess grease is purged from the cavity. Replace the plugs.

FAN DRIVES

Units are supplied with fan shaft bearings that do not require maintenance but may be relubricated per Table 59.

Lubricate with a premium quality NLGI 2 grade multi-purpose roller bearing grease having corrosion inhibitors, anti-oxidant additives and mechanical stability for high speed operation. The grease should also have a minimum base oil viscosity of 500 SUS at 100°F. Do not use a heavy, long fibered grease.

The presents of dirt, moisture or chemical fumes around the bearings requires more frequent lubrication.

Fill bearings with lubricant prior to extended shutdown or storage. Rotate the shaft monthly during idle periods.

Avoid excessive grease purging from seals during lubrication, this reduces the life of the bearing.

OUTDOOR COIL

Dirt should not be allowed to accumulate on the outdoor coil surface or other parts in the air circuit. Cleaning should be as often as necessary to keep coil clean. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean coil, be sure power to the unit is shut off prior to cleaning.

NOTE: Exercise care when cleaning the coil so that the coil fins are not damaged.

Do not permit the hot condenser air discharge to be obstructed by overhanging structures or shrubs.

GAS BURNER

Periodically (at least annually at the beginning of each heating season) make a visual check of the main burner flame.

TO CLEAN BURNERS

Remove them from the furnace as explained in BURNER INSTRUCTIONS. Clean burners with hot water applied along top of the burner.

COMBUSTION AIR DISCHARGE

Visually inspect discharge outlet periodically to make sure that the buildup of soot and dirt is not excessive. If necessary, clean to maintain adequate combustion air discharge.

CLEANING FLUE PASSAGES AND HEATING ELEMENTS

With proper combustion adjustment, the heating element of a gas fired furnace will seldom need cleaning. If the element should become sooted, it can be cleaned as follows:

1. Remove the burner assembly as outlined in BURNER INSTRUCTIONS.
2. Remove the screws holding the top of the flue collector box. Carefully remove the top of the flue collector box. The draft wheel, housing, and draft motor can remain assembled to the flue box top, if cleaning of these components is not required.
3. This will provide access to flue baffles, then remove the flue baffles from the tube interiors. To remove, the flue baffles, remove the stainless steel screws from the vest panel. Refer to Figure 48.
4. Using a wire brush on a flexible wand, brush out the inside of each heat exchanger from the burner inlet and flue outlet ends.
5. Brush out the inside of the flue collector box, and the flue baffles.
6. Run the wire brush down the vent hoods from the flue collector end.
7. If soot build-up is particularly bad, remove the vent motor and clean the wheels and housings. Run the wire brush down the flue extension at the outlet of the vent housings.
8. After brushing is complete, blow all brushed areas with air or nitrogen. Vacuum as needed.
9. Replace parts in the order they were moved in steps 1 to 4.

10. Assure that all seams on the vent side of the combustion systems are air tight. Apply a high temperature (+500°F) sealing compound where needed (Dow Corning, Silastic 736, Loctite Superflex 596 or equivalent).

    NOTE: One end of each flue baffle is provided with a sharper bend than the other end - this sharper bend must be positioned at the tube and attached with a stainless steel screw.

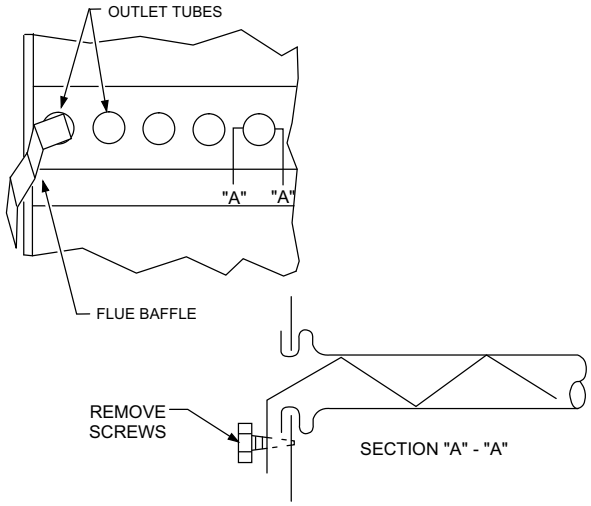


FIGURE 48 - TYPICAL FLUE BAFFLE

The restrictor plate must also be sealed to furnace tube sheet.

SECURE OWNERS APPROVAL

When the system is functioning properly, secure the owner's approval. Show him the location of all disconnect switches and the room temperature sensors. Teach him how to start and stop the unit and how to adjust the temperature settings within the limitations of the system.

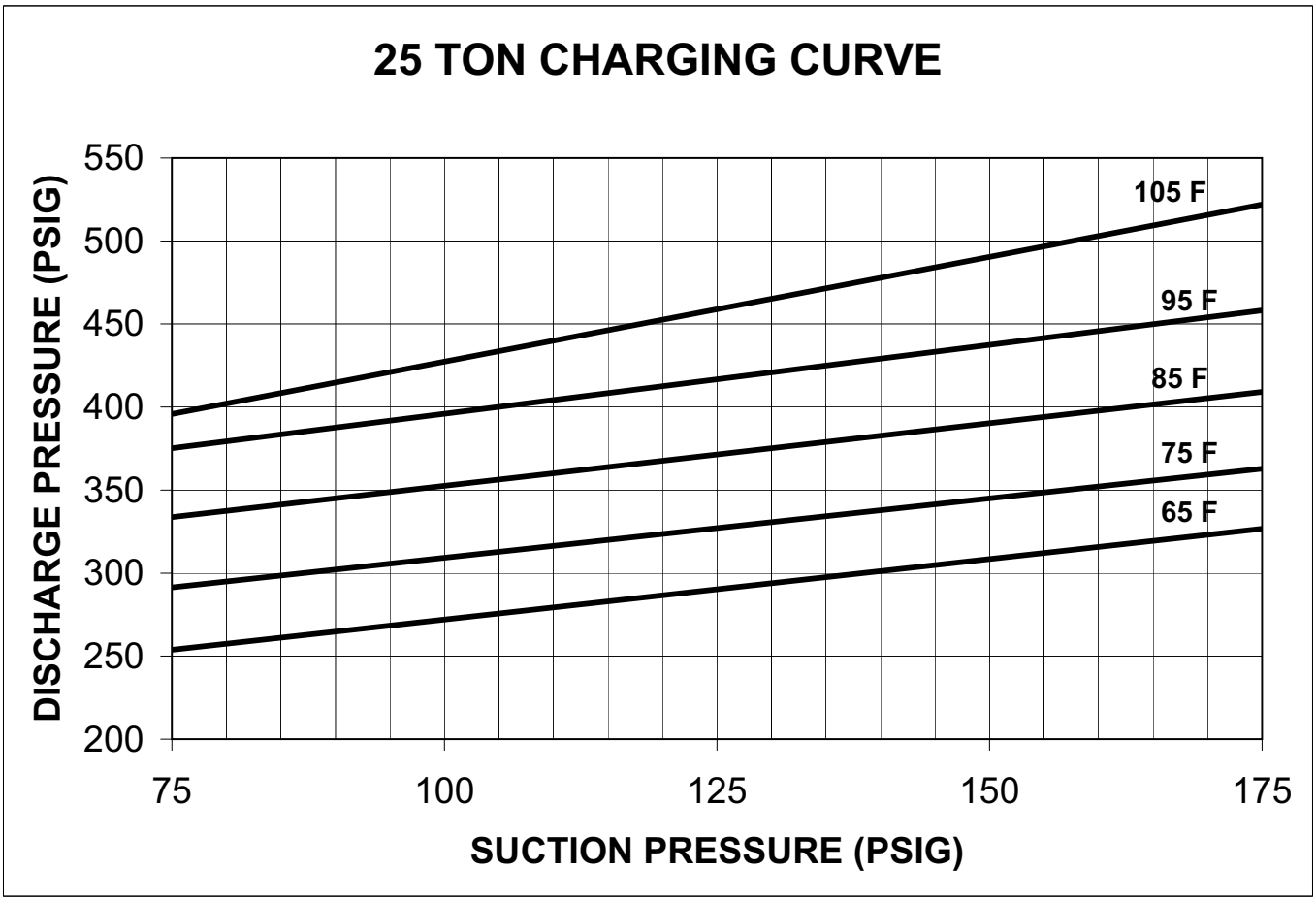


FIGURE 49 - 25 TON CHARGING CURVE

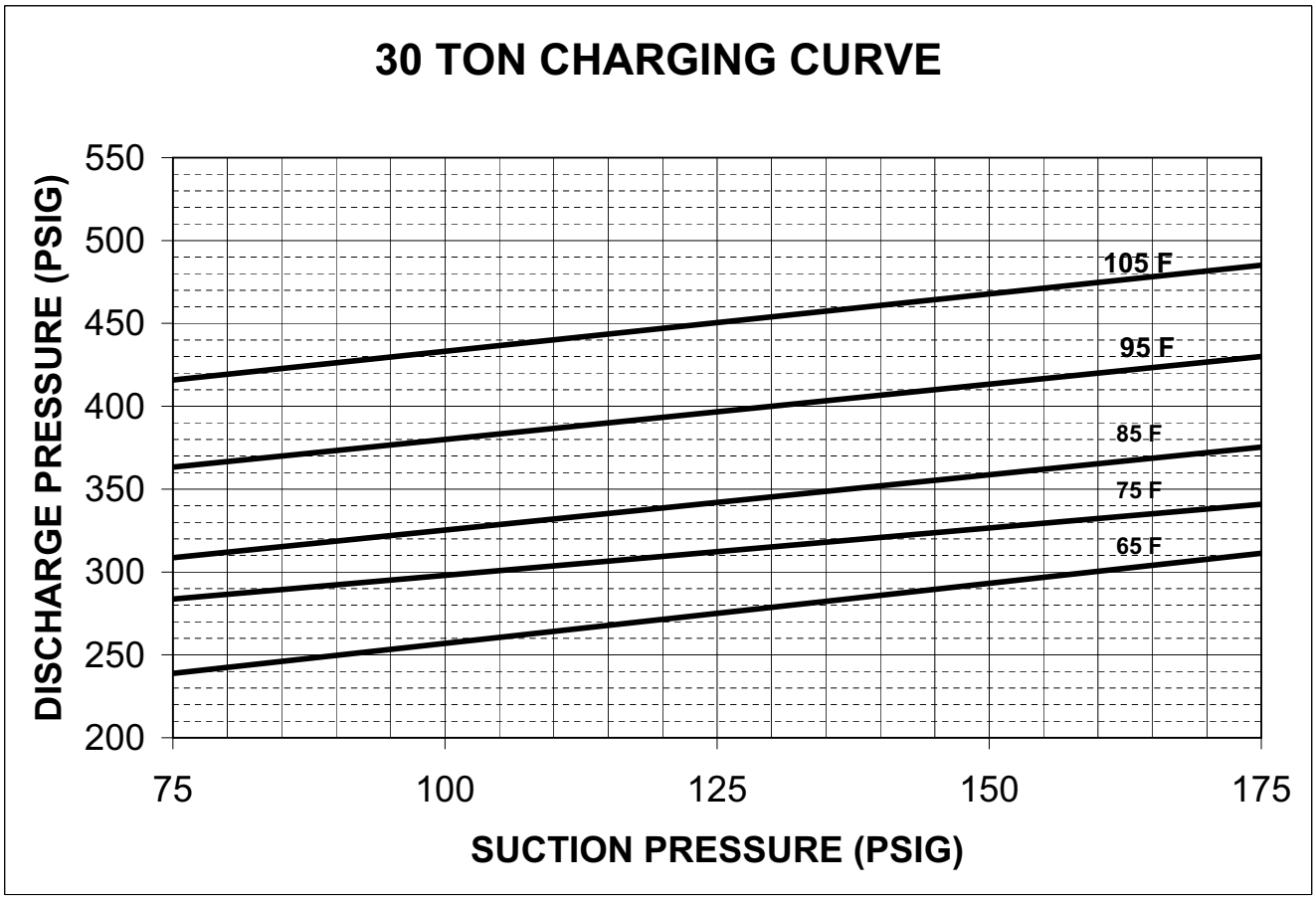


FIGURE 50 - 30 TON CHARGING CURVE

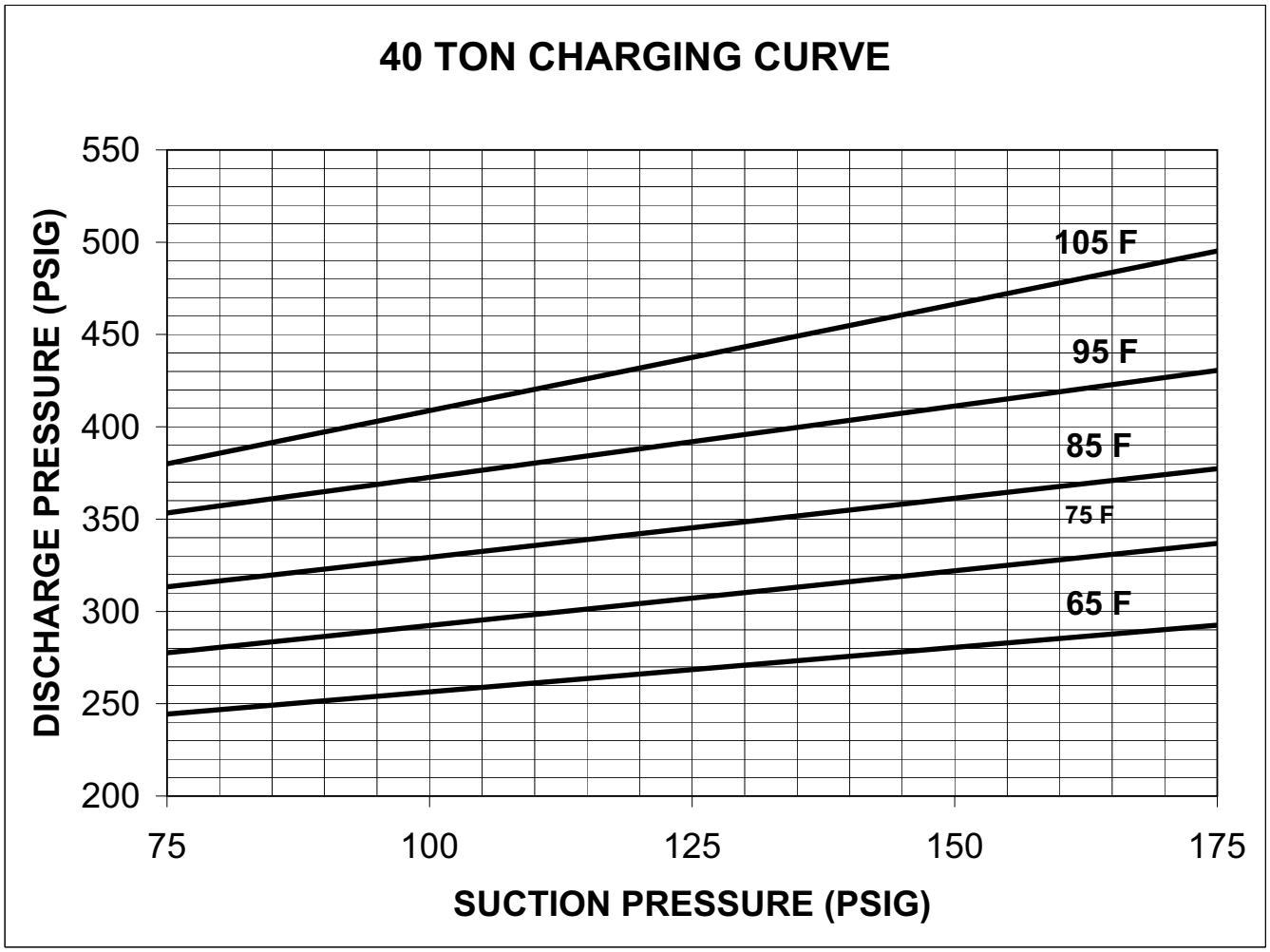


FIGURE 51 - 40 TON CHARGING CURVE

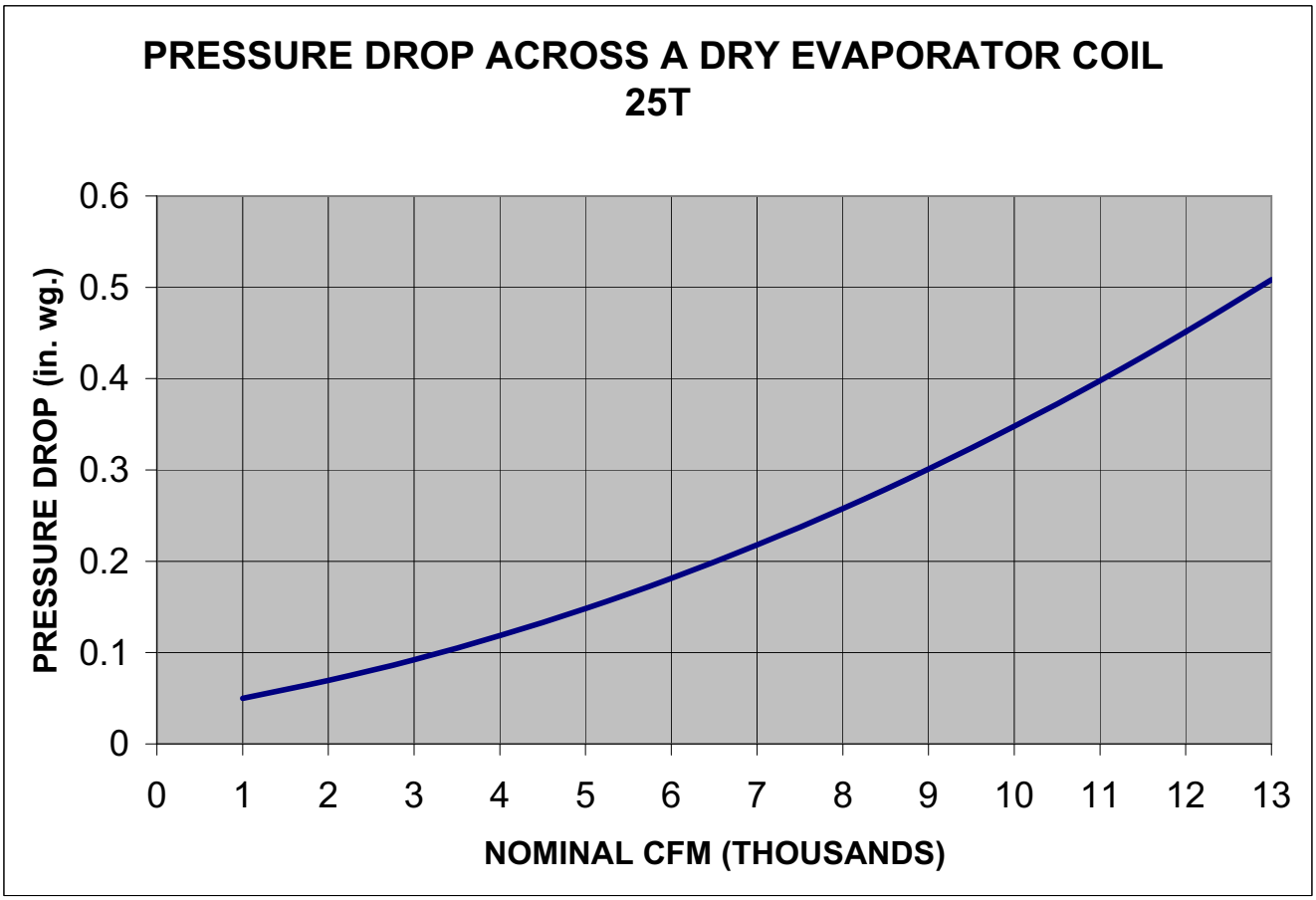


FIGURE 52 - PRESSURE DROP DRY EVAPORATOR COIL VS SUPPLY AIR CFM - 25 TON

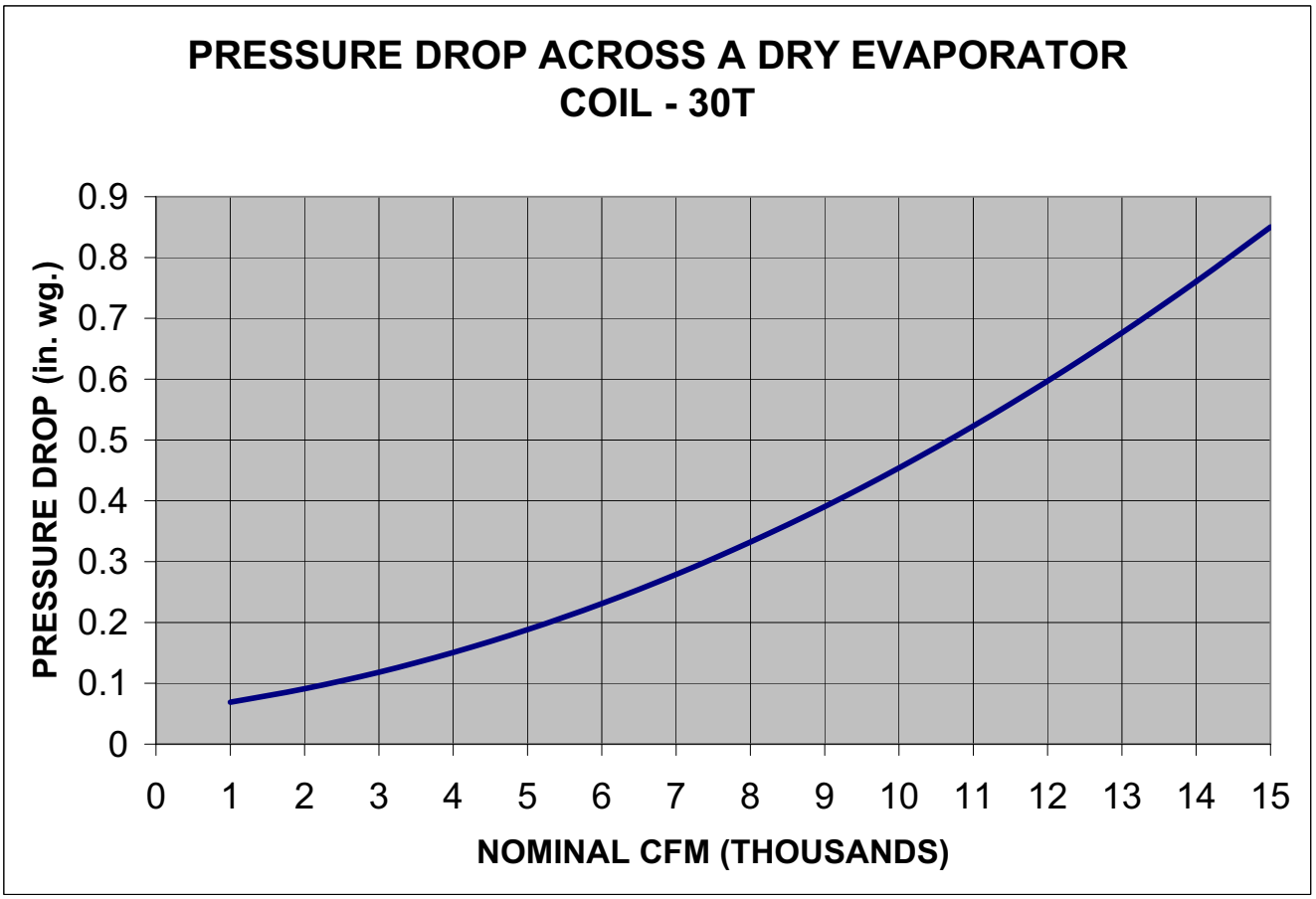


FIGURE 53 - PRESSURE DROP DRY EVAPORATOR COIL VS SUPPLY AIR CFM - 30 TON

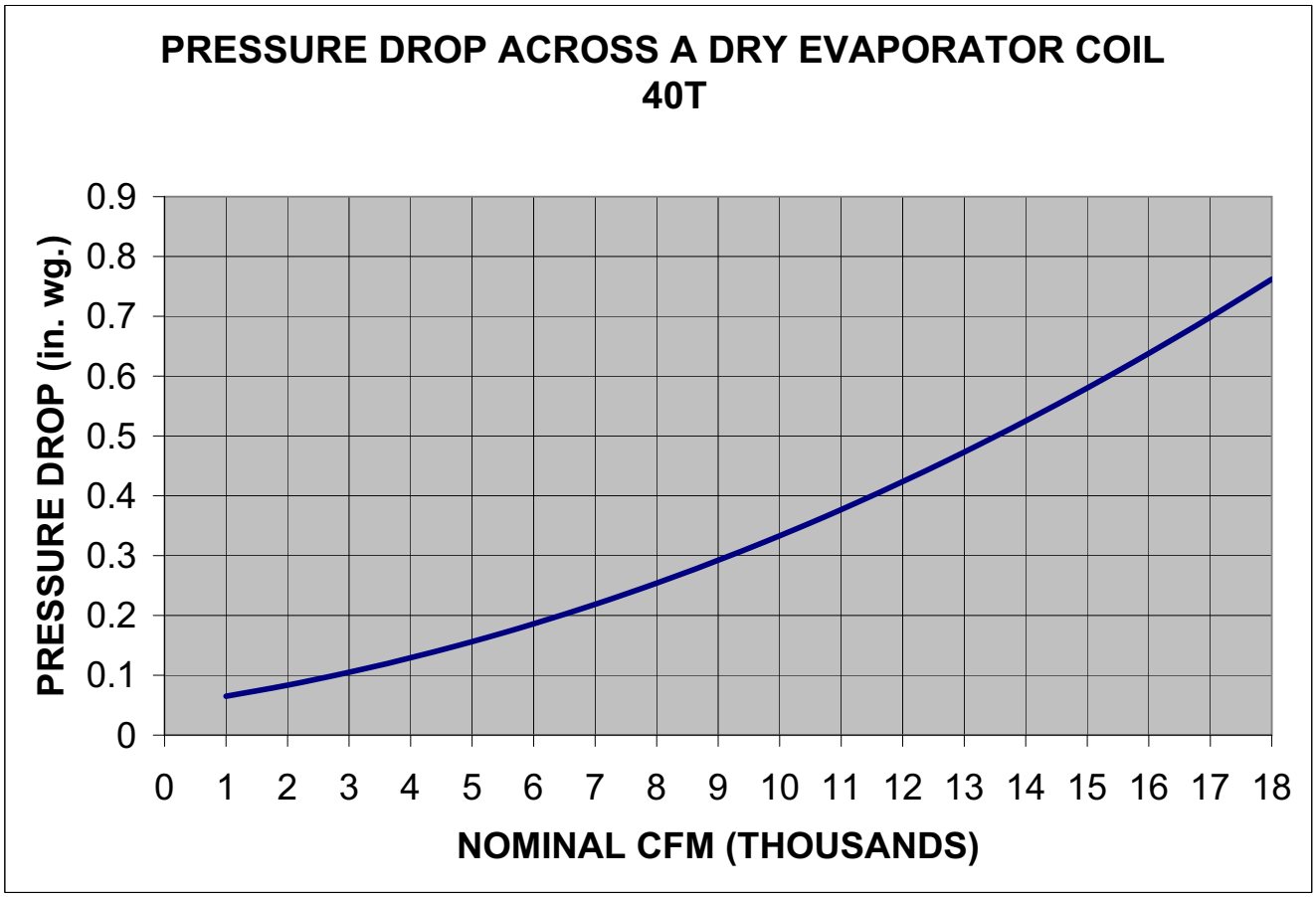


FIGURE 54 - PRESSURE DROP DRY EVAPORATOR COIL VS SUPPLY AIR CFM - 40 TON

R-410A QUICK REFERENCE GUIDE

Refer to Installation Instructions for specific installation requirements.

- **R-410A Refrigerant operates at 50 - 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.**
- **R-410A Refrigerant cylinders are rose colored.**
- **Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400, or DOT BW400.**
- **Recovery equipment must be rated for R-410A.**
- **Do Not use R-410A service equipment on R-22 systems. All hoses, gages, recovery cylinders, charging cylinders and recovery equipment must be dedicated for use on R-410A systems only.**
- **Manifold sets must be at least 700 psig high side, and 180 psig low side, with 550 psig retard.**
- **All hoses must have a service pressure rating of 800 psig.**
- **Leak detectors must be designed to detect HFC refrigerants.**
- **Systems must be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose.**
- **R-410A can only be used with POE type oils.**
- **POE type oils rapidly absorb moisture from the atmosphere.**
- **Vacuum pumps will not remove moisture from POE type oils.**
- **Do not use liquid line driers with a rated working pressure rating less than 600 psig.**
- **Do not install suction line driers in the liquid line.**
- **A liquid line drier is required on every unit.**
- **Do not use a R-22 TXV. If a TXV is to be used, it must be a R-410A TXV.**
- **Never open system to atmosphere when under a vacuum.**
- **If system must be opened for service, evacuate system then break the vacuum with dry nitrogen and replace all filter driers.**

FIGURE 55 - R-410A QUICK REFERENCE GUIDE

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